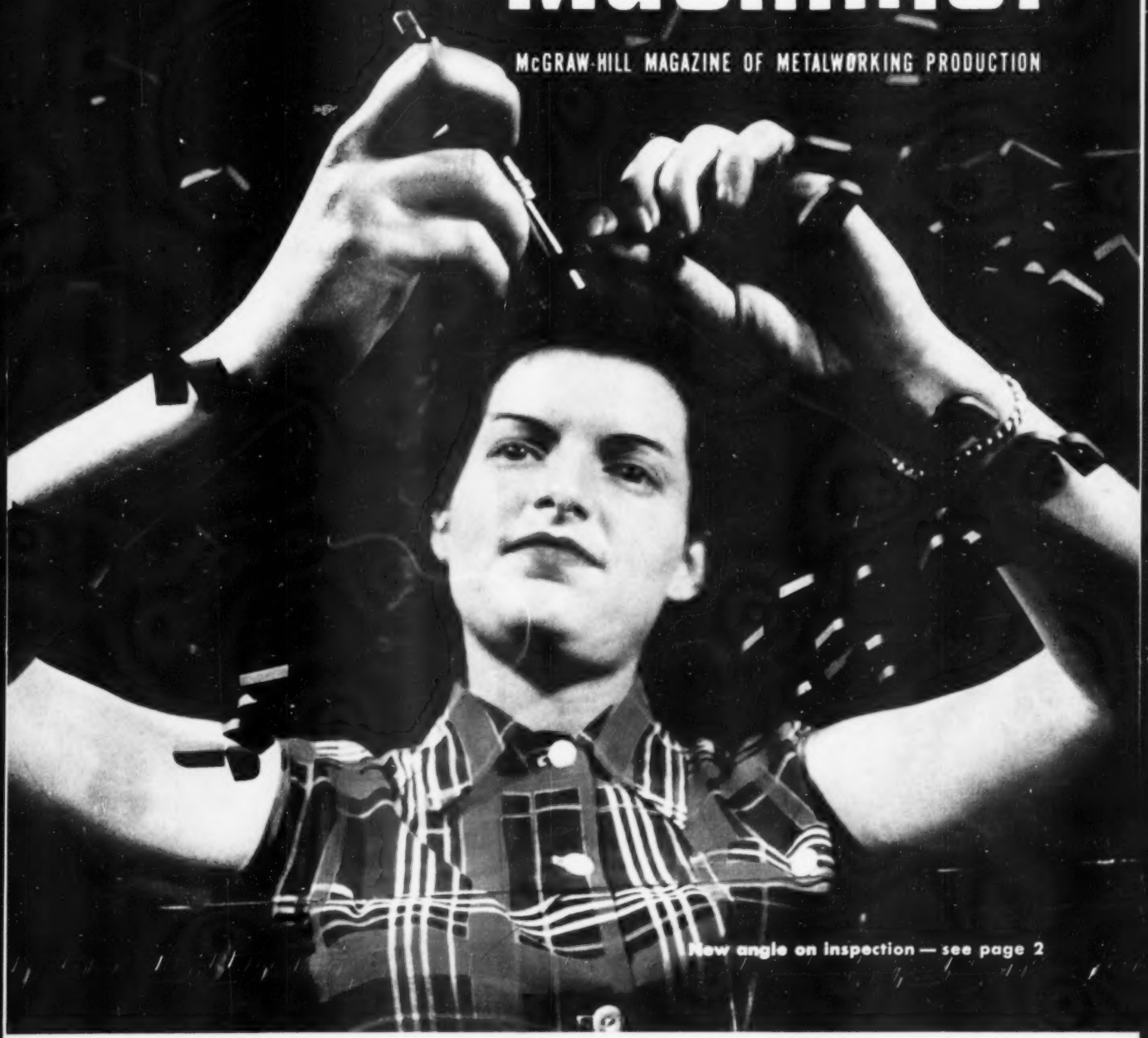
PRICE 50 CENTS

MARCH 2, 1953

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



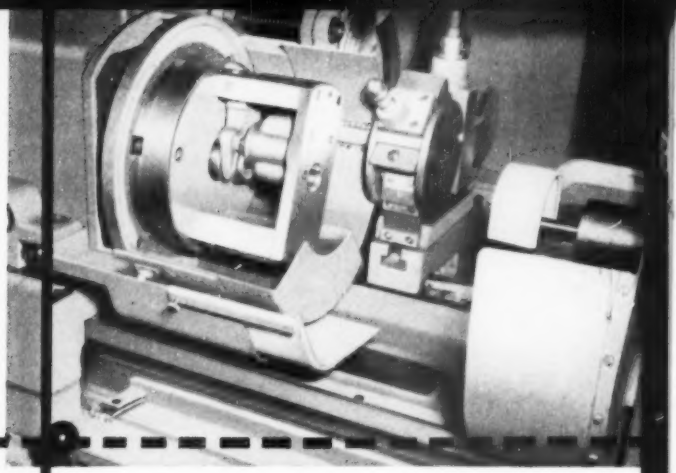
New angle on inspection — see page 2

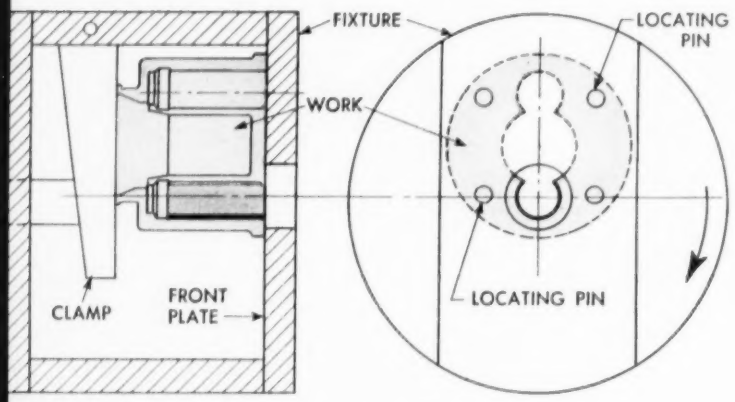
Modern Non-Destructive Testing — A SPECIAL REPORT

Contour Grinding with Abrasive Belts — FIRST OF A SERIES

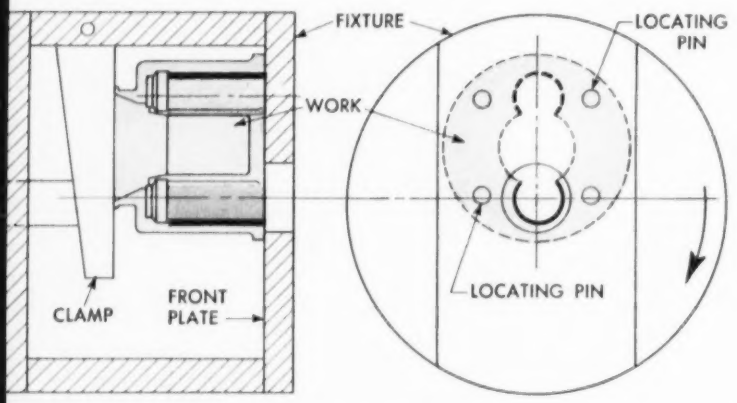
Heald Model 271 Size-Matic grinds

TWO OFF-CENTER BORES





Side and end view of clamping fixture with universal joint body in place. Color indicates surface ground in first operation.



Here part has been turned 180° in fixture and the second open-sided bore has been ground.

Universal joint body with double, open-sided bore, turned 180° in fixture for secondary grind

You can't grind two off-center holes in a rotating part at the same time. So you grind them in sequence. In such cases, it's important to have a work-holding fixture that permits fast, easy relocation of the part for the secondary grind. Here's a typical example.

The machine, a model 271 Size-Matic, is designed for precision internal grinding of double open-sided bores in universal joint bodies. The work is hydraulically clamped in a quick-change, balloon type fixture. After the first bore is ground, the part is simply unclamped, turned 180° in the fixture, reclamped and ground on the second bore. Note that the holes are open on one side, giving an interrupted surface for the grinding operation.

The part locates against the flange face and on pins through holes in the part.

Remember—when it comes to precision finishing, it pays to come to Heald.

HEALD

Case Study No. 2236-97 in

PRECISION PRODUCTION

INTERNAL AND ROTARY SURFACE GRINDING MACHINES AND BORE-MATICS

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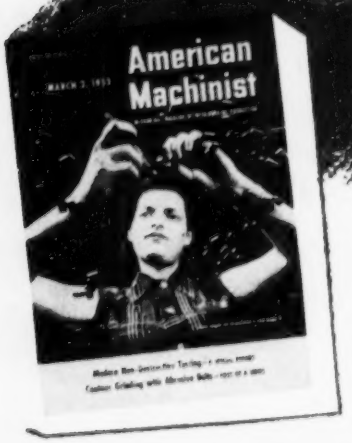


Chips and QUIPS

Hands Up . . . Our color cover depicts one of the most unusual—and one of the simplest—inspection operations we've seen in some time. The young lady is checking tungsten-carbide blanks at Carboloy, first for absence of nicks and broken edges or corners, next with the "mike" for dimensions. It was found that a glass table top gave the best working surface; the carbide pieces "floated" on it rather than scratching. Frosted glass with a light below showed up edge defects clearly, too. The photographer, George Burns (brother of Jim, who has taken so many photos for us) used artistic license and substituted clear glass for this unusual-angle shot.

Incidentally, the Brothers Burns operate their own studio in Schenectady, from which come many pix for *The Saturday Evening Post*, as well as *AM*.

Tooling . . . Tool engineers will be smitten by an article describing a new holder for carbide tips, together with a job on which it was used. The tool, developed by Leo J St Clair, increases tool life and permits highter cutting speeds . . . There's also a story on a graphic method of controlling stock removal in machining parts that are to be ground subsequently. The charts provide dimensions and tolerances necessary for grinding stock—and no more. Charles J Marks of Production Engrg at Pratt & Whitney Aircraft tells the story . . . George Piper, product engineer for Western Electric at Indianapolis, also explains a progressive die with two built-in tapping heads actuated by the press ram. It's quite a story, combining machining and press-work . . . There are also a half a dozen Shop Shots showing unusual tooling.

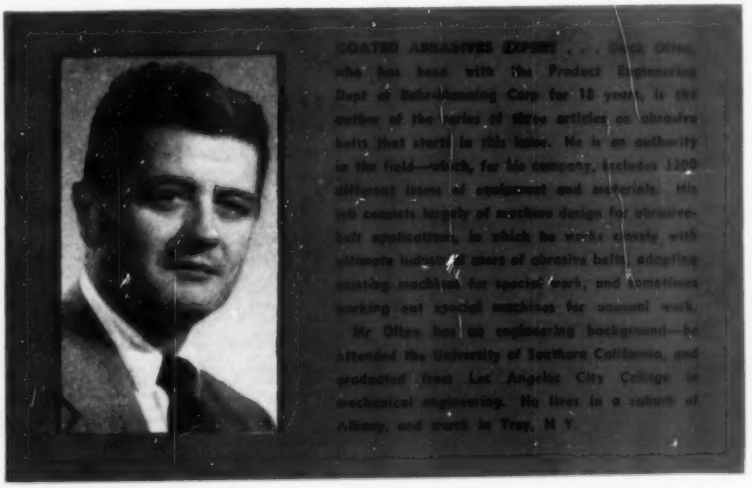
More Red Tools . . . Every so often, there's a leak in the Iron Curtain. This time a series of pictures of new Soviet machine tools leaked through. We've put them into three pages, with some data on each. There are some surprising ones among them—including a piston-making machine which starts with ingot, produces finish-machined pieces, then greases, wraps and inspects them, and requires only four men.

Belts . . . We began, some months ago, to get a real roundup on what can be done with abrasive belts. Our research didn't go too well until Dirck Olton, of Behr-Manning, took an interest. The result is a 3-part article, mostly pictures, of examples of belt grinding, by hand, semi-automatic, and automatic methods. The series starts with our lead article in this issue.

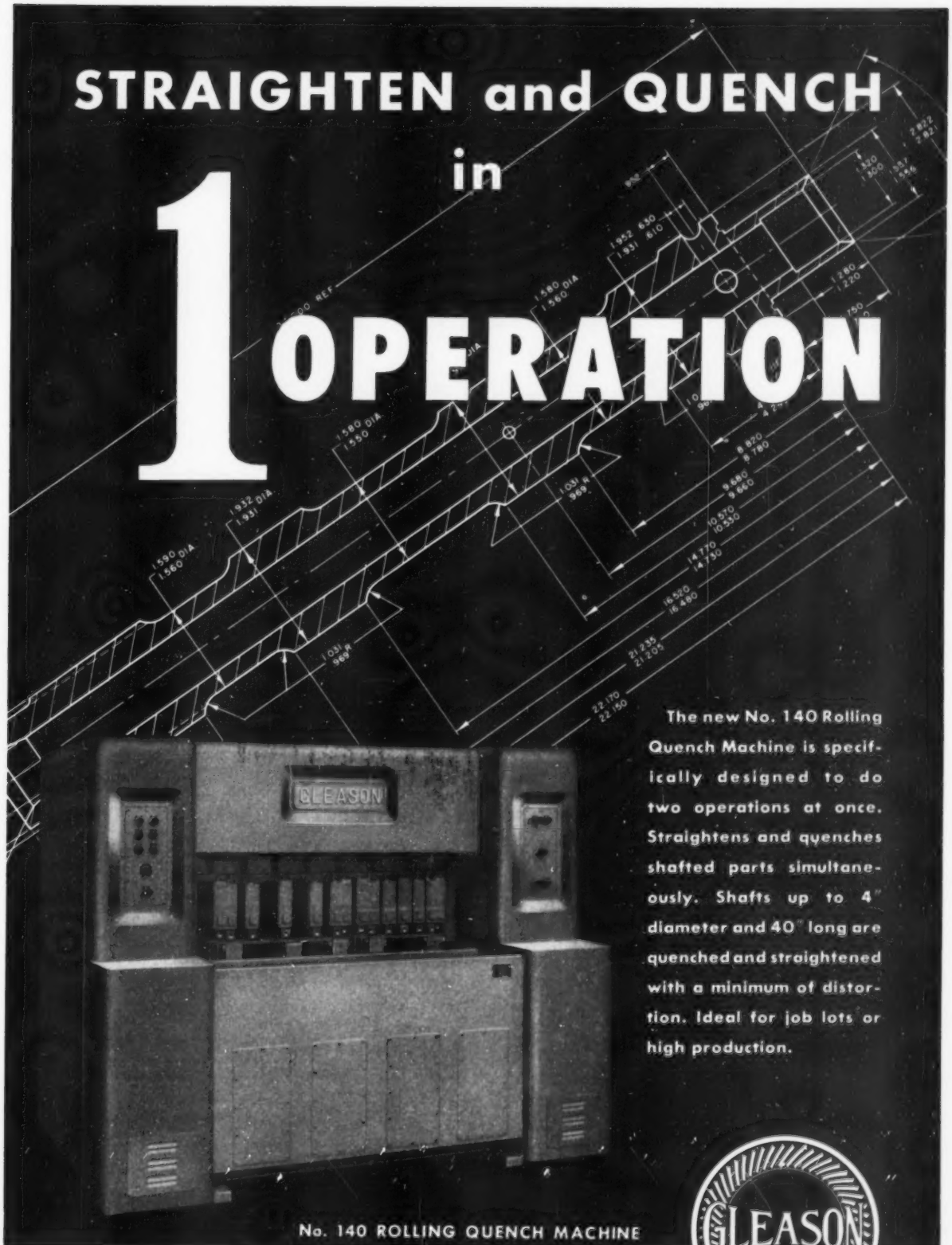
No Destruction . . . There's much to know about the testing of castings. In our current Special Report, J M Anspach of Meehanite Metal Corp tells how to seek out defective material before expensive machining stages. A few years ago, only visual inspection and the sectioning method (destructive) could tell you about surface and methods, each with its own field of applications. The author explains equipment and procedure, and compares the methods on a cost basis.

Assembly . . . John P Emmerich, field engineer for American Silver Co, gives us techniques in the use of a precoated braze metal on the work stock. It speeds brazing and takes out some of the headaches . . . Also of interest to men in assembly is a page of tips on use of fork trucks—a compact reference.

Coming . . . *AM* for March 16 is a busy issue. The Special Report is 16 pages on cost accounting for the small shop, prepared by an authority. There are articles on high-frequency brazing, on chip handling at De Soto, coordinate setting, dieing machines, supervisor training, and on a self-positioning jig. There are also two 6-pagers, one on cutting estimating time 66% by direct data, the other on saving $250,000 a year by relayout, better handling, and improved methods at Walker Turner Div of Kearney & Trecker. There's also a cover showing some chips in full color—familiar, often unappreciated, sight.


COATED ABRASIVES EXPERT . . . Dirck Olton, who has been with The Product Engineering Dept of Behr-Manning Corp for 18 years, is the author of the series of three articles on abrasive belts that starts in this issue. He is an authority in the field—which, for his company, includes 1300 different items of equipment and materials. His job consists largely of machine design for abrasive-belt applications, in which he works closely with ultimate users of abrasive belts, adapting existing machines for special work, and sometimes working out special machines for unusual work.
Mr Olton has an engineering background—he attended the University of Southern California, and graduated from Los Angeles City College in mechanical engineering. He lives in a suburb of Albany, and works in Troy, N Y.

STRAIGHTEN and QUENCH in 1 OPERATION



The new No. 140 Rolling Quench Machine is specifically designed to do two operations at once. Straightens and quenches shafted parts simultaneously. Shafts up to 4" diameter and 40" long are quenched and straightened with a minimum of distortion. Ideal for job lots or high production.

No. 140 ROLLING QUENCH MACHINE

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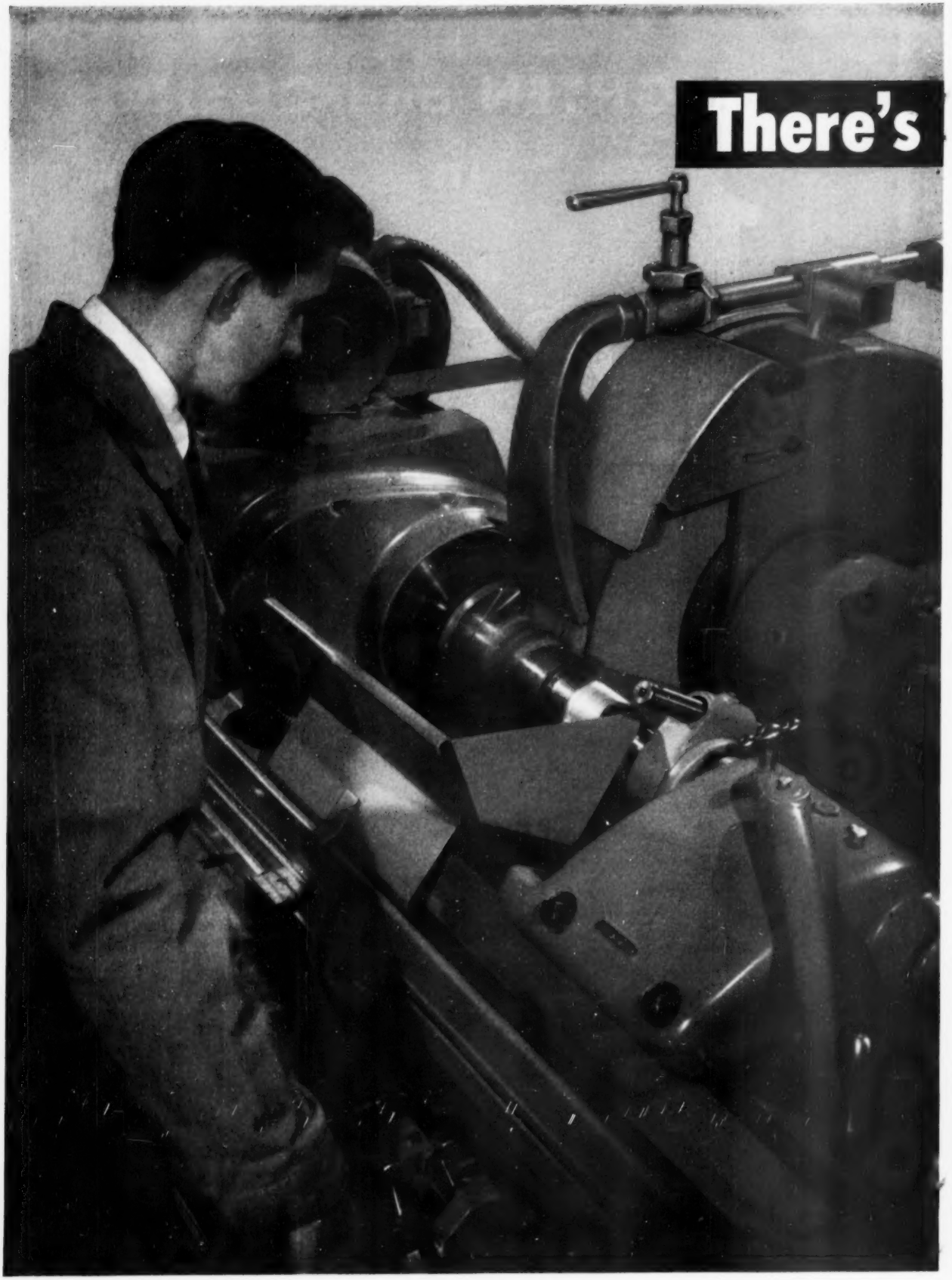
There's

No Time Like the Present

To Replace Your Worn-Out Plain Grinders

Proper timing spells success in farming, driving a golf ball, making an investment. Proper timing in replacing shop equipment is right now . . . right now while business is good and deliveries of many types of machine tools have improved. ¶In the field of precision centertype grinding, machines that no longer earn their keep should be replaced now, and your best replacement bet is CINCINNATI FILMATICS. For example, consider the medium-sized group, 6", 10"-L, 10" and 14"-L. There are many reasons why these machines should be your first choice:

CINCINNATI

FILMATIC

You can reduce the cost of a variety of grinding operations, like the one shown at the left, by replacing old equipment with new CINCINNATI FILMATIC Plain Hydraulic Grinders.

CINCINNATI FILMATIC No. 10"-L Plain Hydraulic Grinding Machine. Catalogs No. G-566-2 and No. G-603 contain complete data on the medium-sized group. Write for copies.

a) Grinding wheel spindle bearings are FILMATICS. They are dependable . . . require no adjustment, and run for years without attention.

b) Accurate table reversal within .004"; for safely grinding close to shoulders.

c) Two-speed manual table and cross traverse; for convenience in setting up the machine.

d) Single START-STOP lever for coolant flow, headstock spindle rotation and table traverse; reduces operating fatigue.

Conveniently grouped, easily manipulated control elements; filtered, pressure lubrication for ways; infinitely variable table traverse rates of 3" to 240" per minute; V-belt and silent chain headstock drive, for smooth rotation of headstock spindle; these and many other advantages are yours with CINCINNATI FILMATIC Plain Hydraulic Grinders. Compare new CINCINNATI'S with your old plain grinders and you'll see why it will pay you to replace now. Complete data in catalog Nos. G-566-2 and G-603, or look in Sweet's File for Mechanical Industries.

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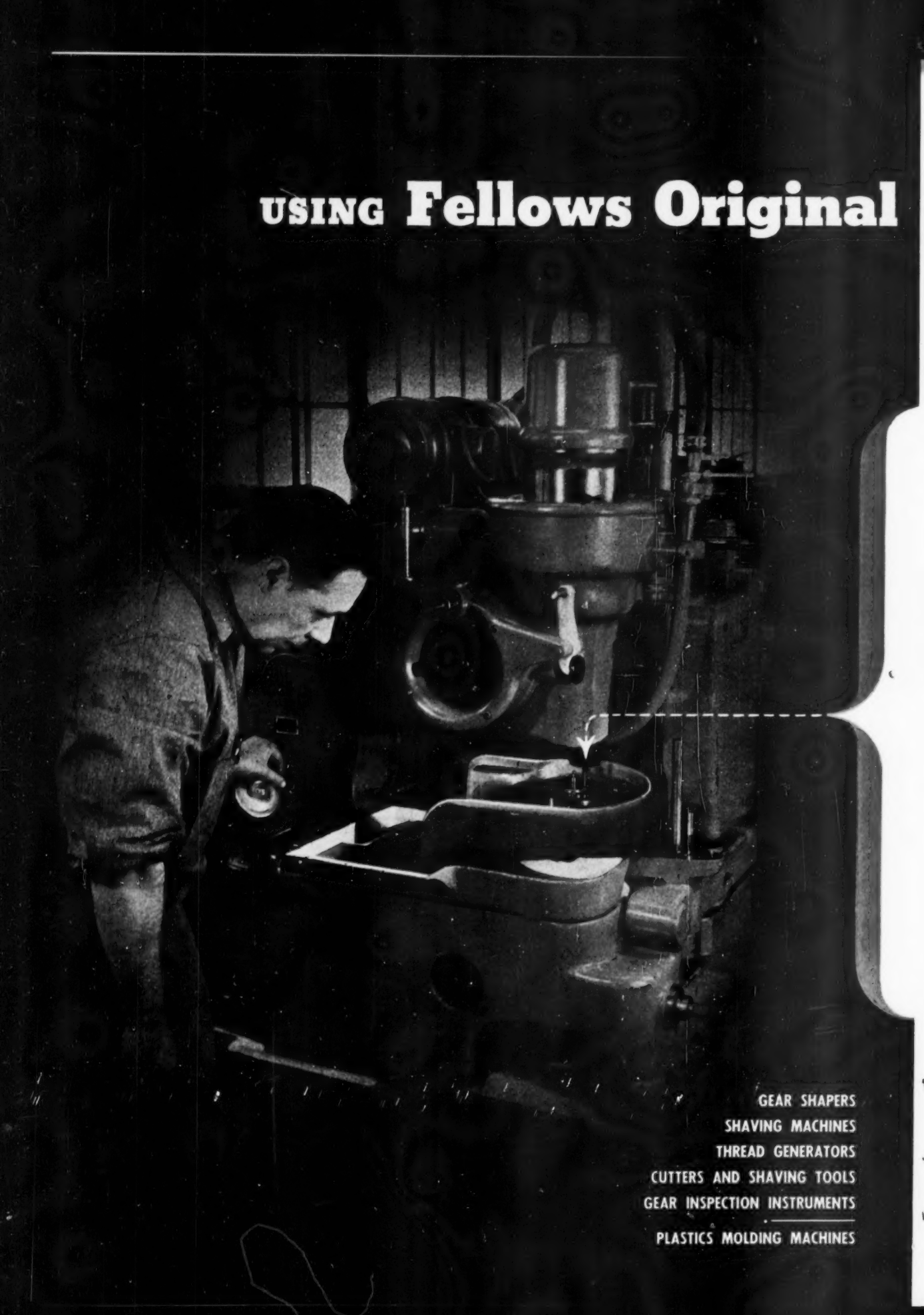
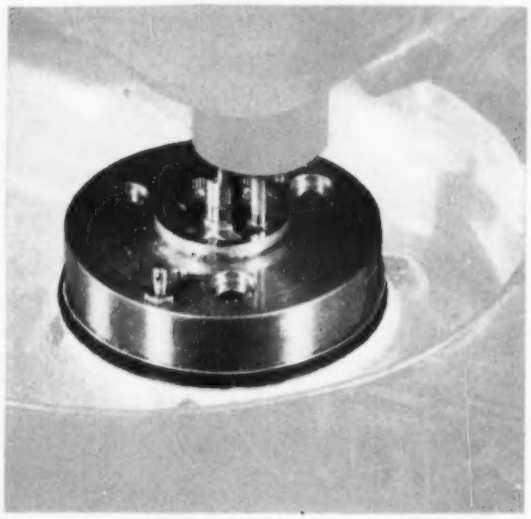


GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

Cutters . . .

CONTROL INSTRUMENT COMPANY KEEPS REJECTS "well under 1%"



Control Instrument Company of Brooklyn, New York, uses a Fellows 7-Type Gear Shaper to cut this 2.000" pitch diameter internal gear for a military fire-control device.

Using original Fellows cutters for both rough and finish cuts of this 4140 Chrome Moly steel, the number of rejects is exceedingly small. Control Instrument Company says, "...using Fellows cutters, our rejects are well under 1%."

The versatile Fellows 7-Type is the most widely used size in Fellows' complete line of Gear Shapers which generate gears from 1/16" to 120" diameter. It offers precision and high production on external gears up to 7" and internal gears up to 6" pitch diameter and 2" face width. Set-up is simple, and changeover on production runs is quick.

For helpful information on cutting coarse or fine pitch gears, cams, ratchet teeth, interrupted profiles, segment gears, face gears, racks, and other unusual, high quality gears—just write, wire or 'phone the Fellows office nearest you.

PRODUCTION DATA

Number of Teeth (Cutter) (Limited by projecting hub)	18
Number of Teeth (Gear)	96
Pitch	48
Pressure Angle	20°
Pitch Diameter	2.000 (+.002; −.000)
Run Out (Total Indicator Reading)	.001
Number of Cuts	2
Production Time (2 Cuts)	90 minutes
Blank Material	4140 Chrome Moly Steel

Fellows

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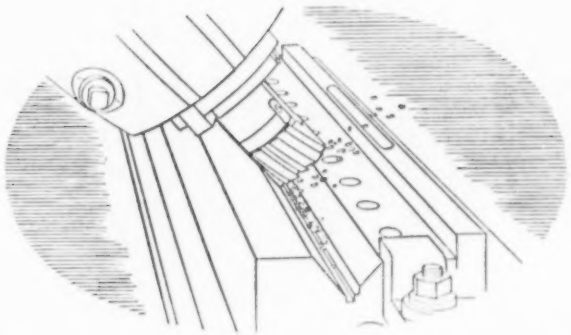
VAN NORMAN
VAN NORMAN
SPECIFICATIONS
No. 36 Ram Type Miller
• Cutterhead in Angular Position
• Table: 58" x 13"
• 18 Speeds: 30 to 1500
• 18 Feeds: 3/8 to 32

Ram-Type Millers

TAKE A
GOOD CUT
in Milling Production Costs!



Adjustable Cutterhead Plus Movable Ram, Saddle Cross and Knee Vertical Feeds Increase Work Range • Reduce Costs

Van Norman Ram Type Millers embody many outstanding features which provide for faster, more economical milling in the tool room, pattern shop, die and mold shop, experimental laboratory and production line.

The combined adjustments of the cutterhead and ram movement permits conventional horizontal, vertical as well as angular milling on one machine. With Van Norman Millers, most non-productive time is eliminated, production is increased, while costs are reduced.

EASY TO OPERATE . . . Front and Rear control of operation (all millers from 22L and up) power and manual feeds, six-way rapid traverse.

WIDE RANGE OF USE . . . Adjustable Cutterhead — 90° adjustment from horizontal to vertical.

POWER AND RIGIDITY . . . Heavy-duty heat treated gear transmissions; massive cutterhead and ram; rugged column; large knee, saddle and table assemblies.

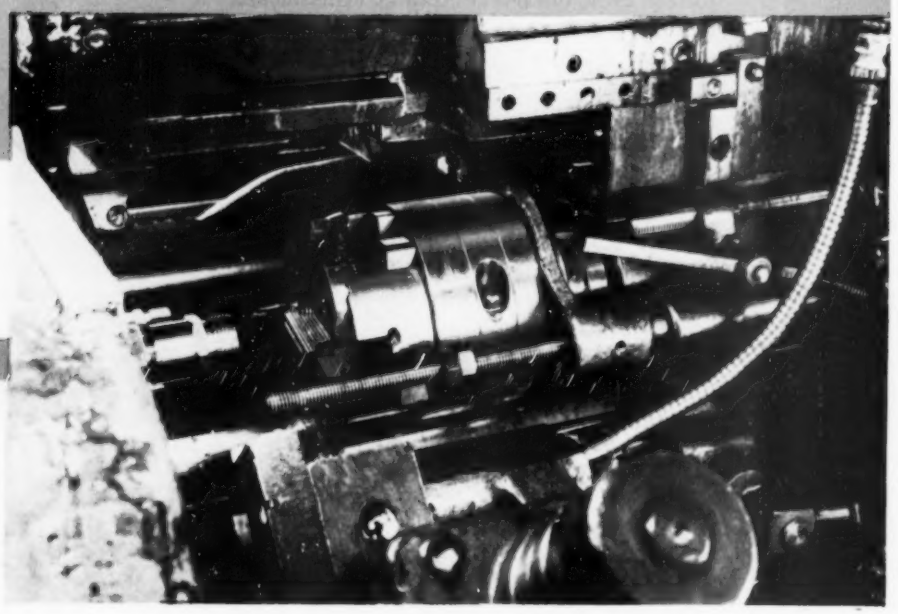
LONG LIFE . . . Automatic lubrication; antifriction bearings, multi-splined shafts. Large diameter feed screws.

Investigate Van Norman Ram Type Millers. There's a size available to meet your particular requirements. Write for information

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS, U. S. A.

For EXTERNAL THREADING BY "Automatics"

LANDEX HEADS Feature Wide Range, Compact Design



WORLD'S

The

A 1¼" JX LANDEX Head on a 1¾" Warner & Swasey Automatic is shown threading ¾" Press-Lock spuds. 1" Straight Pipe threads are cut on B-1113 steel, with an average of 3000 pieces threaded between chaser grinds. These spuds are one of the many types of industrial hose couplings and valves produced by the Dixon Valve and Coupling Company of Philadelphia.

The LANDEX is a yoke-operated head compactly designed for use on live-spindle machines where die head clearance is limited. They are built in ½", 13/16", 1¼", and 2" sizes, and each size will cut a wide range of thread diameters. For example, the 1¼" LANDEX shown will cut threads ¼" to 1¼" in diameter, and oversize chaser holders (available for all LANDEX JX Heads) will allow cutting thread diameters up to 2¾".

Write for Bulletin F-90.

LARGEST EXCLUSIVE MANUFACTURERS OF THREAD GENERATING EQUIPMENT

LANDIS *Machine* COMPANY

WAYNESBORO · PENNSYLVANIA · U.S.A.

368-C

6 Cost Cutting Ideas with Modern Landis Plain Grinders

Landis tooling combines grinding operations . . . cuts cost per finished piece

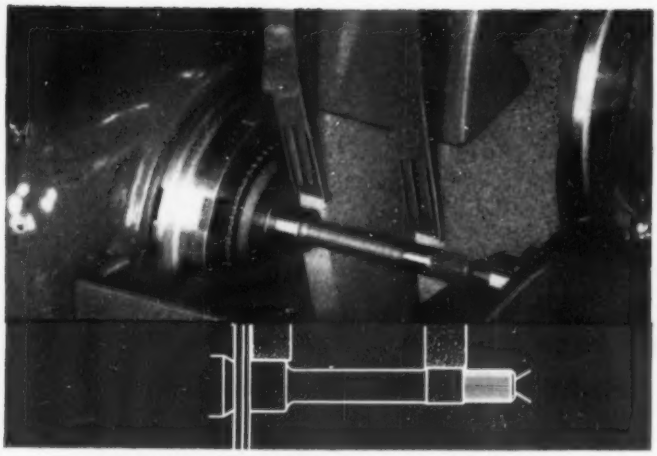
155

10" x 18" Landis Type CH Plain Hydraulic Grinder

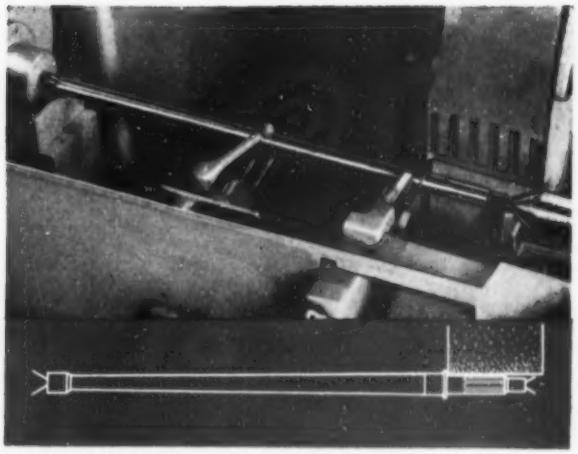
These are typical examples showing why cost conscious production men depend on modern Landis Grinders to lower cost per finished piece. Send prints of your work pieces for production and tooling estimates. Landis Tool Company, Waynesboro, Pennsylvania.

LANDIS

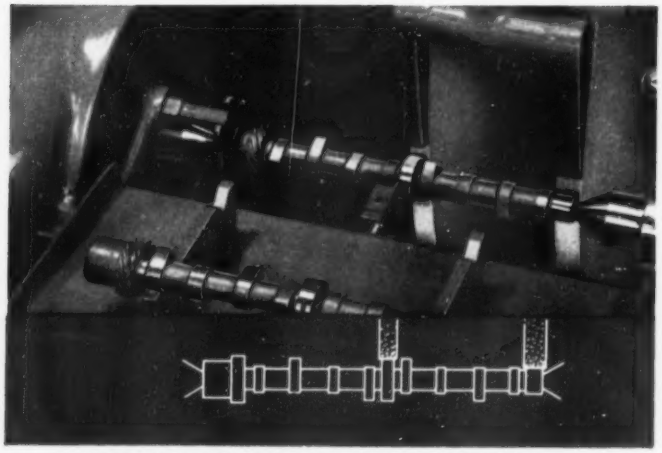
precision grinders



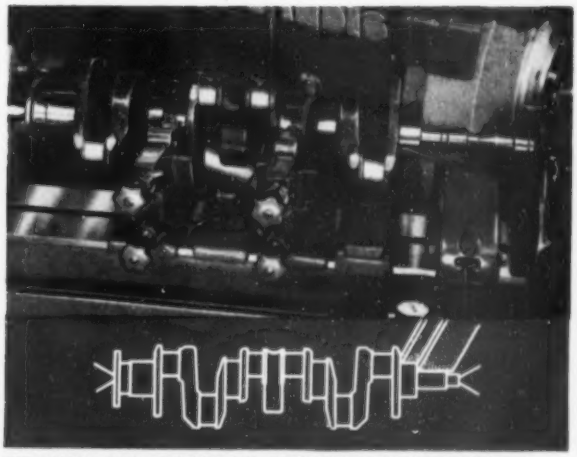
TWO DIAMETERS GROUND IN ONE OPERATION—by straight infeed with spaced wheels.



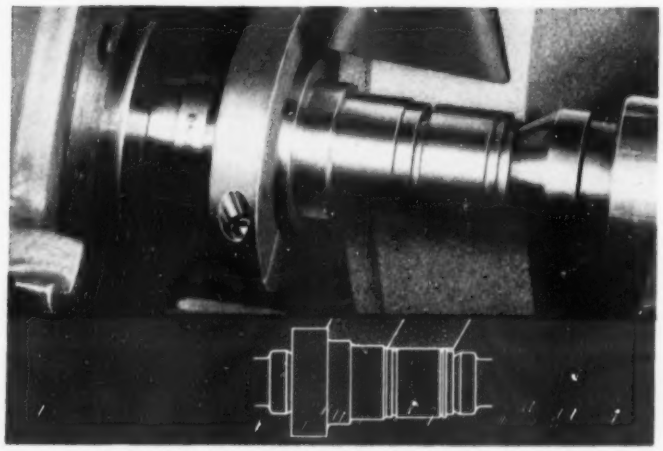
GRINDING DIAMETER AND ADJOINING RADIUS—in first operation. Second operation grinds adjoining diameter.



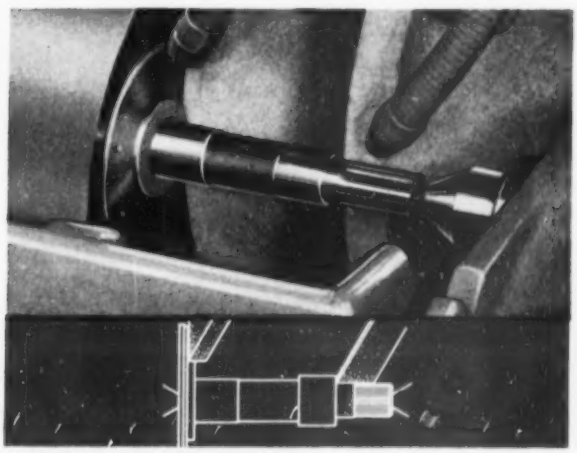
GRINDING TWO DIAMETERS IN ONE OPERATION—Straight infeed grinding with spaced wheels.



GRINDING END DIAMETERS AND FACE OF CRANKSHAFT—in one operation using spaced wheels on wheelbase set at 30° angle.



FACE AND THREE DIAMETERS GROUND IN ONE OPERATION—using a wide wheel, profile dressed and wheelbase set at 30°.



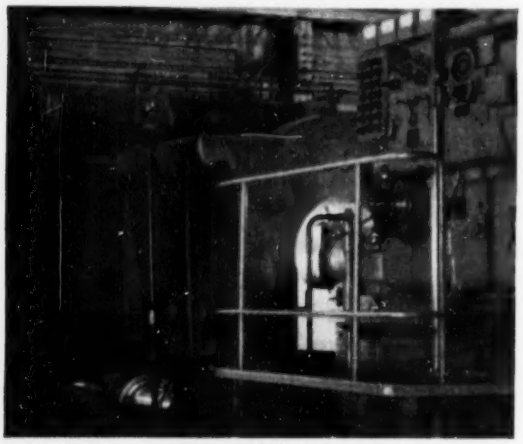
GRINDING TWO DIAMETERS WITH ADJOINING FACES—in one operation. Wheelbase set at 30°. Straight infeed grinding.

Here's extra capacity for huge,

Now, throughout the G&L 50 Series' wide work range, you can accurately bore, mill or face up to 60" from the headstock . . . parallel or at right angles to the spindle

G&L 50 Series Horizontal Boring, Drilling and Milling Machines, with their open construction, are already well-known for their *extra-big-work* capacity. Now, they can be built with a new underarm support which provides hitherto impossible rigidity for heavy-duty milling, facing, boring and shaping tools *at distances to 60 inches* from the headstock face.

Six standard model tools can be easily mounted on the underarm: 46" face plate drive, 48" continuous feed facing head, 90° angular milling attachment, 90° offset milling attachment, spindle support and shaping attachment.



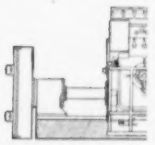
Boring head in operation on a difficult interrupted cut inside a large combination fabricated and cast housing.

Simplifies 75- to 125-ton jobs

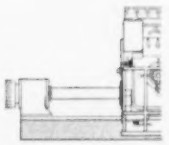
This new development gives you the flexibility necessary to keep costs in line on both routine or difficult 75- to 125-ton jobs. By increasing the number of operations you can perform without resetting the workpiece, it greatly reduces handling, setup and labor costs.

If you'd like to know how G&L machines can improve your shop's work capacity . . . give you increased production at far lower cost — contact your nearest G&L representative or write direct. BUT DON'T DELAY . . . DELIVERY ON G&L MACHINES MAY BE SOONER THAN YOU THINK!

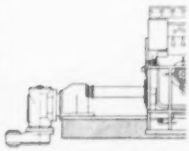
TYPICAL WAYS YOU CAN USE UNDERARM



Underarm extended spindle support with continuous feed facing head.



Underarm extended spindle support with face mill.



Underarm right angle swivel milling attachment with offset attachment.

G-24

GIDDINGS & LEWIS

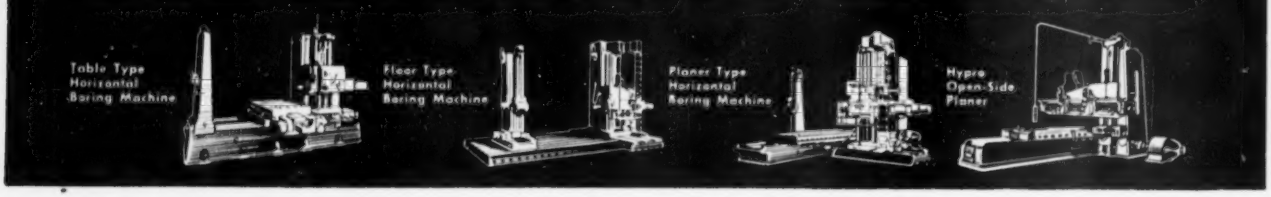
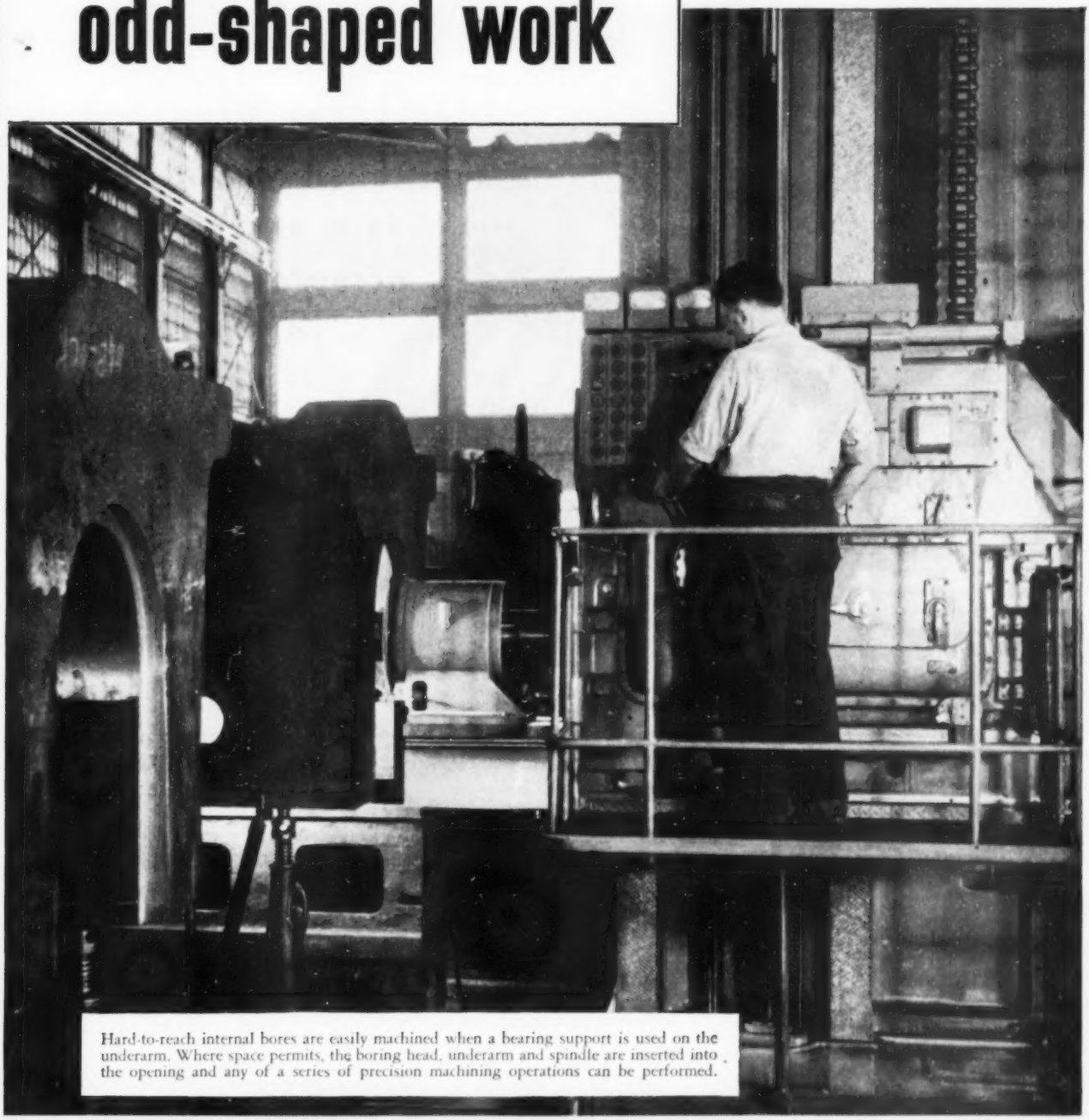


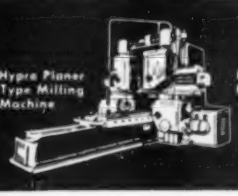
Table Type Horizontal Boring Machine
Floor Type Horizontal Boring Machine
Planer Type Horizontal Boring Machine
Hypro Open-Side Planer

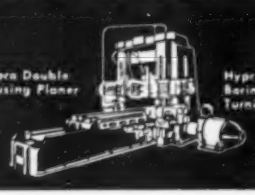
odd-shaped work

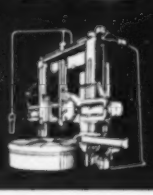


Hard-to-reach internal bores are easily machined when a bearing support is used on the underarm. Where space permits, the boring head, underarm and spindle are inserted into the opening and any of a series of precision machining operations can be performed.

MACHINE TOOL CO.







G&L HYPRO

FOND DU LAC
WISCONSIN

VK HIGH SPEED STEEL THREAD MEASURING WIRES

...basic tools in a universally accepted method of checking screw threads

VK Set No. 20 HS Thread Measuring Wires, accurate to ±.000025" for 20 common pitch Unified and American screw threads, 6 to 36 threads per inch.

The three-wire method is probably the best known and most widely accepted system of measuring pitch diameter of screw threads. Equipment required includes only a set of VK Thread Measuring Wires of proper diameter and an accurate measuring instrument.

Van Keuren Thread Measuring Wires have been developed over a period of many years of pioneering in the precise measurement field. They are made to National Bureau of Standards specifications, are held within .00002" for roundness, straightness and identity and to within .000025" of exact size.

VK Thread Measuring Wires are made of long-wearing, tough and beautifully finished high speed steel and are either 1⅞" or 2" in length. Every wire is subjected to the closest criteria in today's standards of accuracy.

In addition to set No. 20, shown here, VK furnishes many other standard sets as well as special wires in diameters from .001" to 1.500."

The Van Keuren Catalog and Handbook No. 35 contains 91 pages of technical and engineering information on wire measurement of screw threads. This information, compiled from many years research in the field, is available without charge by addressing: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

VK

34th YEAR

THE Van Keuren CO.

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper I Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires

HERE'S PROOF...

that LINK-BELT's Fluid Drive with constant CUSHION ACTION cuts machinery wear and tear

Cutaway shows simple, rugged construction of Link-Belt Fluid Drive.

Now you can use smaller motors and power transmission equipment on your toughest drive problems. What's more, both motors and driven machines will last longer with Link-Belt Fluid Drives.

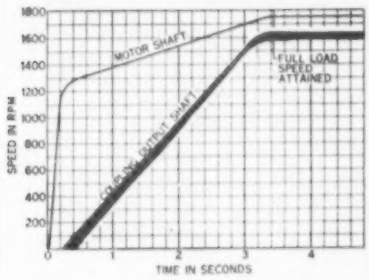
That's because constant CUSHION ACTION provides shock and overload protection . . . and at the same time eliminates high starting torque requirements and high starting currents.

Look at the three sets of curves shown here. See for yourself how constant CUSHION ACTION is the money-saving answer for loads of the high inertia, repetitive shock or high starting torque type.

For complete information, write for Book 2485. It shows how you can put five types of Link-Belt Fluid Drives to work in your plant: Electrofluid Drive, Electrofluid Gearmotor, Fluid Drive, Fluid Gear Drive and Fluid Coupling Drive. 12,853

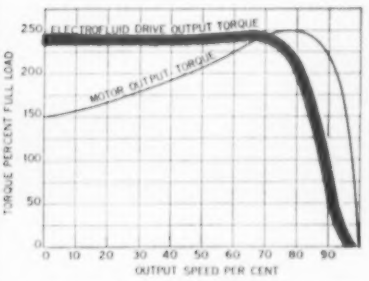
LINK-BELT
FLUID DRIVES

Smooth acceleration - -



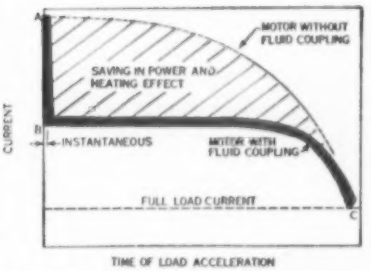
Typical motor and coupling acceleration curves for a high-inertia load show how CUSHION ACTION smoothly and gradually accelerates the load, saving wear and tear on vital equipment.

No overpowering - -



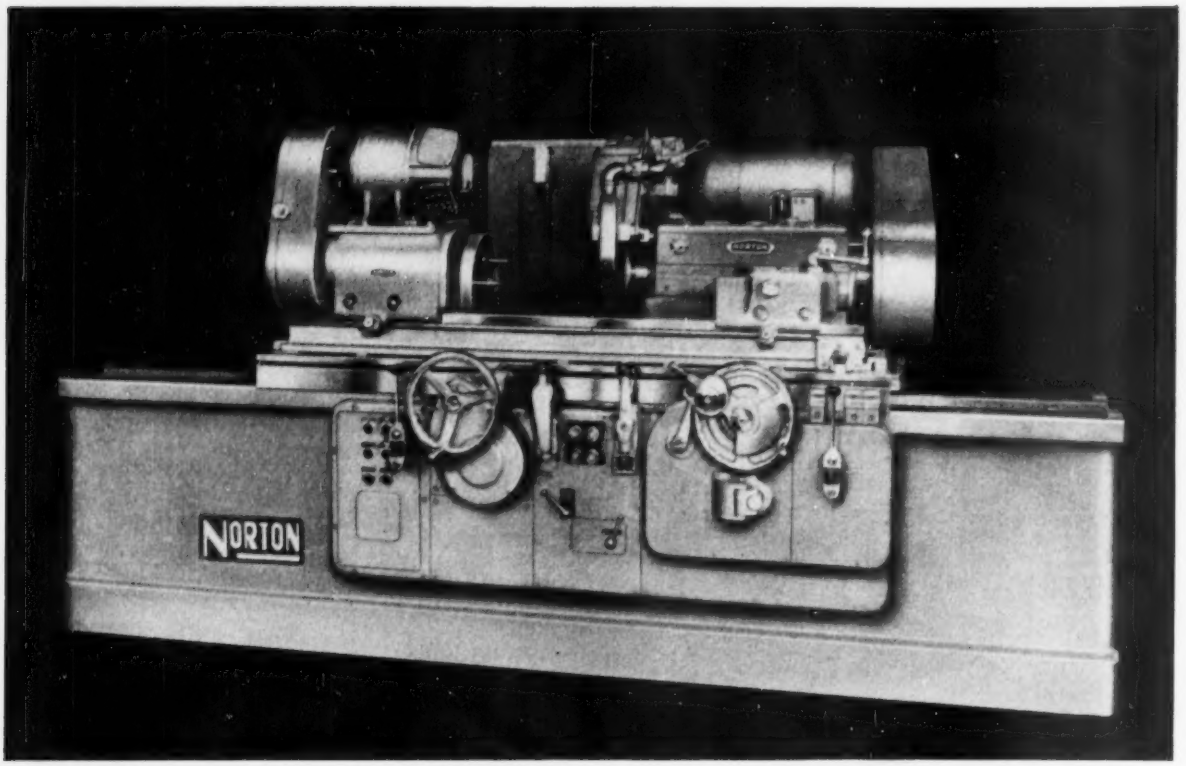
Compare the output torque of a motor with and without the fluid coupling. Because motor accelerates free of load, it reaches maximum pull-out torque that might otherwise require a special type of oversize motor.

Low starting current - -



As these current consumption curves show, with the fluid coupling, motor starting current drops instantaneously to less than half the starting current required by a motor without fluid coupling. Difference represents power savings, reduced heating.

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in Principal Cities.



NORTON 10″ TYPE CTU SEMIAUTOMATIC GRINDER is first choice in production lines and in job shops. No other cylindrical grinder offers you such a unique combination of speed, accuracy, flexibility and sturdiness. No wonder users have reported that Norton 10″ CTU's have doubled production . . . replaced 2 or 3 machines . . . eliminated extra operations . . . made operators more productive . . . and have given them the "Touch of Gold". *Catalog No. 1787* has complete data on sizes, advantages, features and optional equipment that help you put extra profits into your production. It will pay you to look into the high-speed, high-finish grinding this machine makes possible.

These cylindrical grinding machines give you "TOUCH OF GOLD" value . . . in your profit margins

The Norton CTU is such a money-maker it brings you the touch of gold. It adds value to each piece of work it handles — and it actually cuts the cost of grinding . . . thus adding to your product profits.

It's easy to see why. Your operator loads the work . . . *touches one lever* . . . and stands by while the machine does the rest . . . as easy as 1-2-3.

Work is automatically ground to size under electric timer control . . . and the wheel head resets itself for the next cycle.

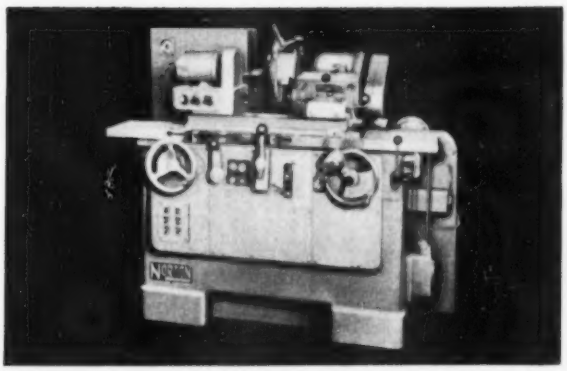
All three basic Norton CTU Semiautomatic Grinders: 4″, 6″, and 10″ offer you the same advantages over their different ranges of work sizes. You can also get the 6″ grinder with a 10″ swing and the 10″ grinder with a 14″ swing by specifying Type LCTU. The Norton line of Type CTU Cylindrical Grinders also includes plain machines for traverse grinding. Your Norton Representative will be glad to help you choose the one that best fits your requirements.

Norton Cylindrical Grinding Machines are just one phase of *the world's most complete line of grinders and lappers* . . . products of Norton's engineering leadership in the development of both grinding wheels and machines.

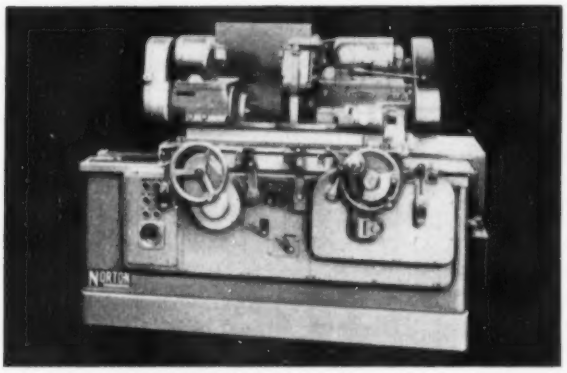
Remember — only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost . . . to have that "Touch of Gold."

Norton welcomes opportunities to work with you on the planning level to fit standard or special grinding machines into your immediate plans or for "post emergency" production.

For complete information, see your Norton Representative or write us direct for the catalogs listed under the machine illustrations. NORTON COMPANY, Machine Division, Worcester 6, Mass.



NEW NORTON 4" TYPE CTU Semiautomatic Grinder in 12" and 18" work length capacities now makes it practical for you to apply high-finish grinding for adding value to small parts. *Catalog No. 531* gives you full details.



NORTON 6" TYPE CTU Semiautomatic Grinder, in 18" and 30" work length capacities, has a performance record that's worth investigating. *Catalog 1488* tells the whole interesting story.

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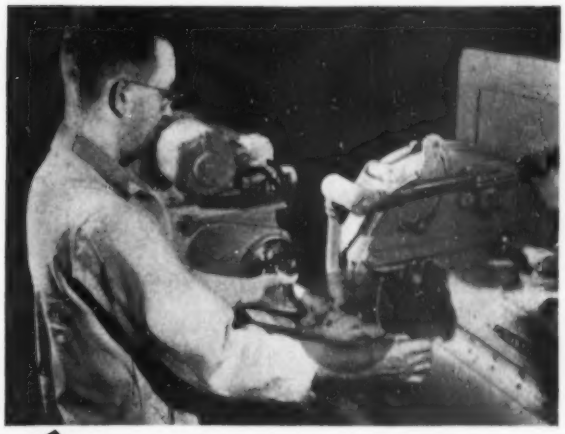
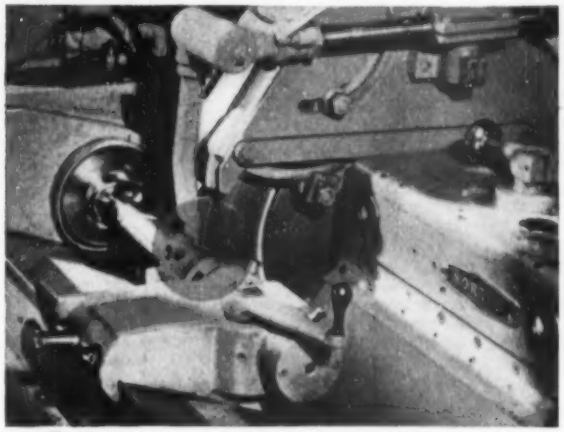
EASY AS *1-2-3*



1. Operator loads machine and touches starting lever.



2. Machine automatically grinds part to required size and finish — while operator attends another machine.

3. Operator unloads machine.

5 MINUTES PER VERSATILE NEW CH

KEARNEY & TRECKER MILWAUKEE

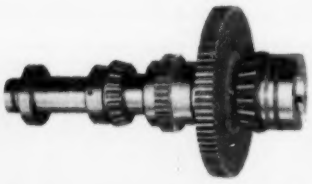
Speeds fabrication of aircraft parts from 75ST aluminum alloy

CH MILLING MACHINE FEATURES THAT HELPED INCREASE OUTPUT — CUT COST PER PIECE

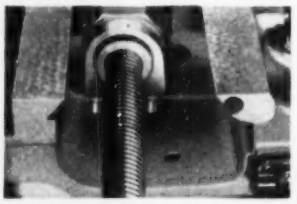
Speed range — *16* speed changes are provided from *25* to *1500* rpm. Automatic protecto-mesh mechanism permits nonclash shifting during speed changes.

Extra-wide feed range — *16* feeds from *¼"* to *32"* per minute meet requirements of new metals and cutting tools for most efficient operation.

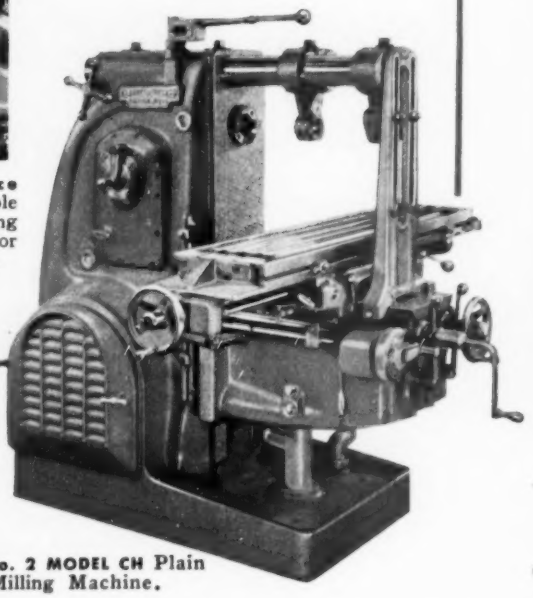
Greater rigidity — Entirely new column . . . heavily ribbed, box section, sponson construction . . . absorbs vibration from heaviest cutting loads.



Greater cutting efficiency design refinements in 3-bearing spindle and a train of heavy duty, wide-faced, forged steel gears, hardened and specially processed.



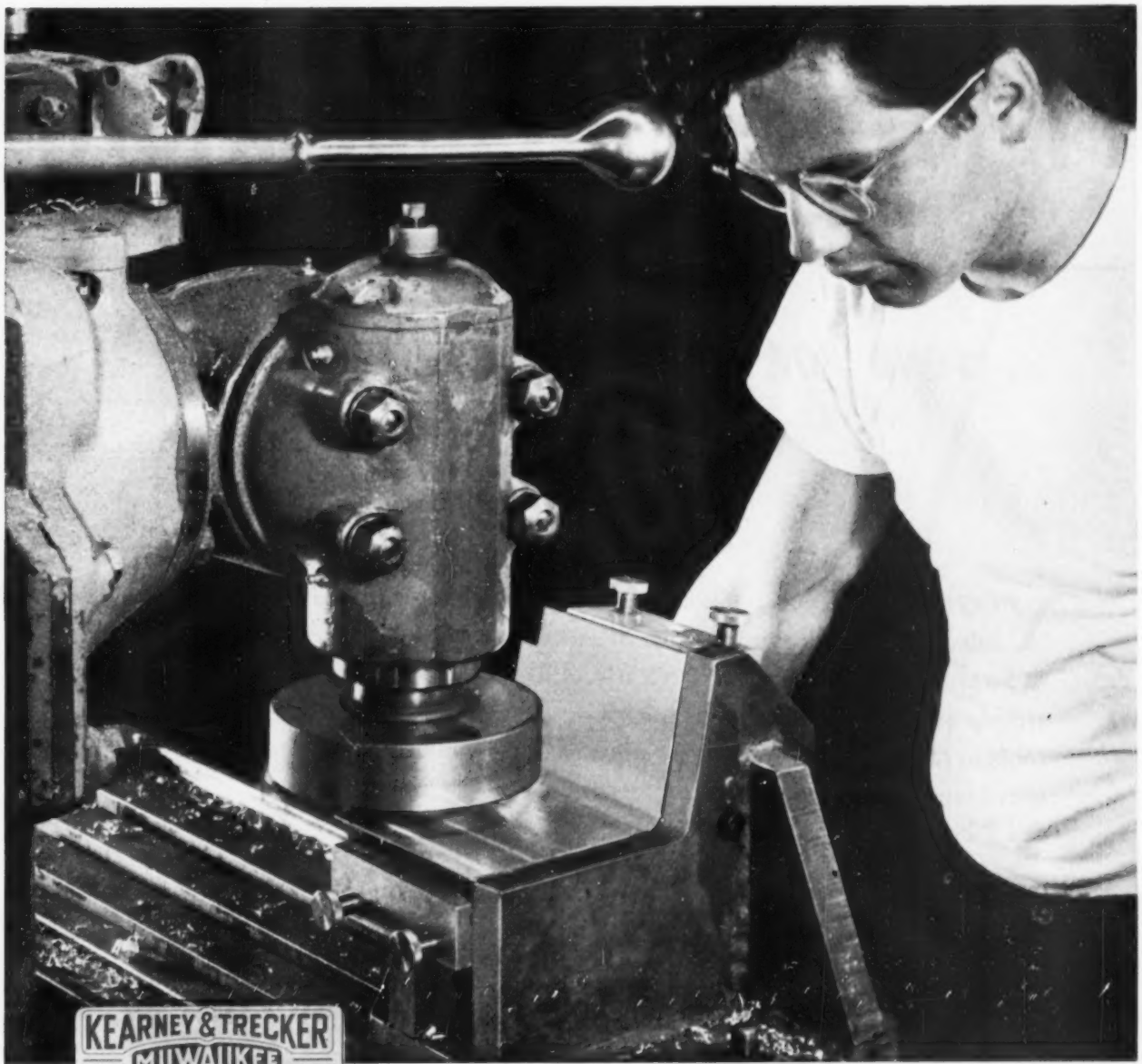
Smoother feed performance through a heavy duty 2" dia. table feed screw. *23%* greater bearing contact between screw nut for longer screw life and accuracy.



5 hp No. 2 MODEL CH Plain Style Milling Machine.

INVESTIGATE the versatile new CH line of milling machines. Their features are job proven to give you cost-cutting results plus greater productivity, better finished products. Contact our nearest representative or write: Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.

PIECE WITH THIS MILLING MACHINE



KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

HERE ARE THE FACTS ON THIS JOB:

Location: - - - - Mar Vista Engineering Co., Los Angeles, Calif.

Machine: - No. 2, Model CH, 5 hp, Plain Style, used with Universal Milling Attachment.

Part: - - Aircraft fitting for horizontal stabilizer.

Material: - - - - - 75ST aluminum alloy.

Cutter: - - - - One blade — 8" fly blade.

Cutter Speed: - - - - 875 rpm, 9 ipm feed.

Depth of Cut: - - - - - - - - - .050".

Production: - 12 pieces per hour — all sides milled.

197 PAGES OF PRACTICAL INFORMATION

SEND FOR THIS FREE BOOK TODAY!

YOU'LL find this new book a real help in selecting and properly using Warner & Swasey turret lathe tools. It clearly and simply explains ways you can use modern tools to take full advantage of the increased speed and power of today's turret lathes. It's a book you won't want to be without —so send for your copy today!

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PRECISION MACHINERY SINCE 1880

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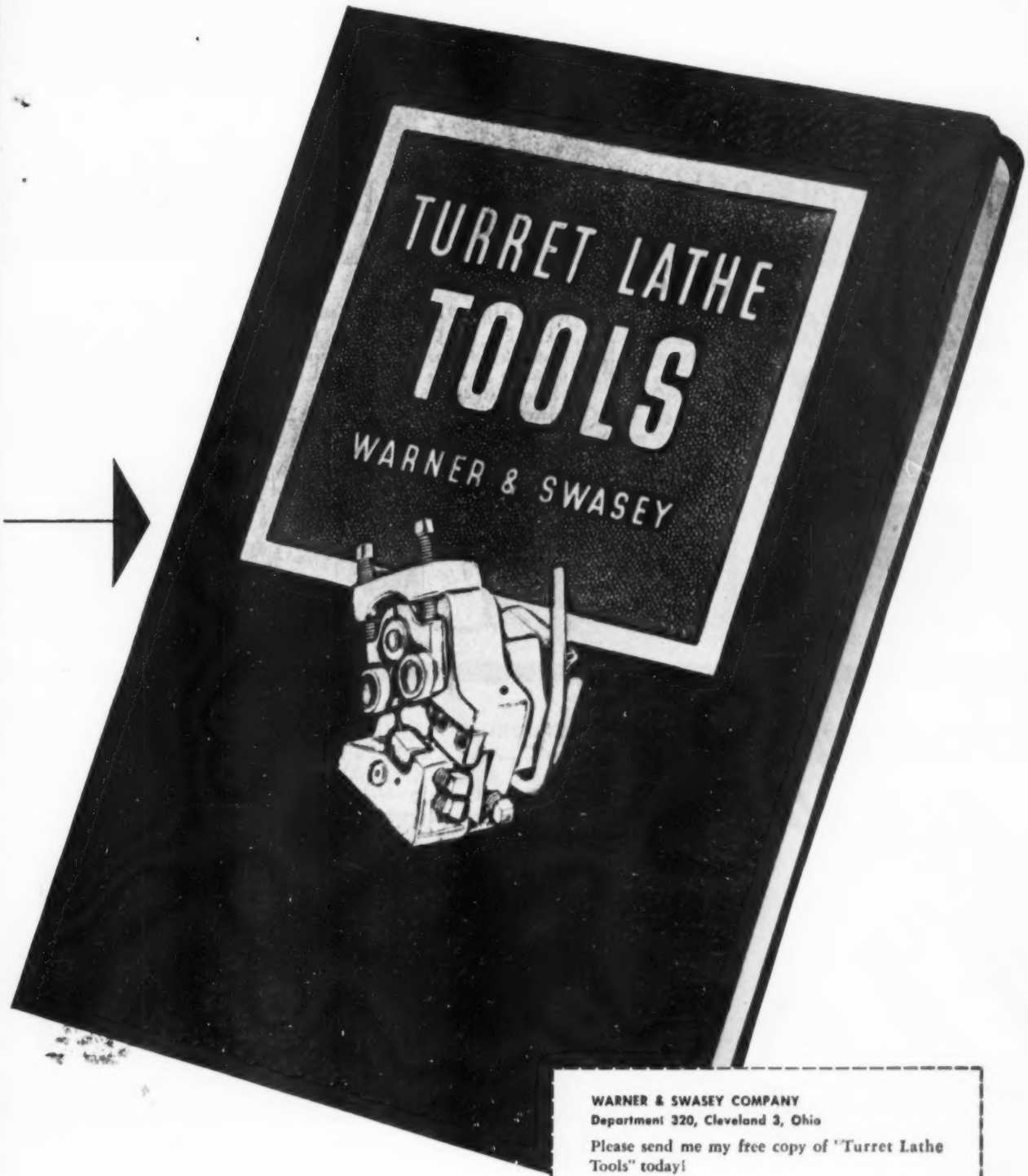

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AM-3-53

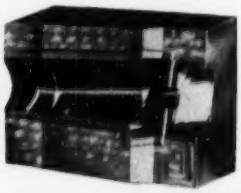
MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

For Jet Blades and for YOU...

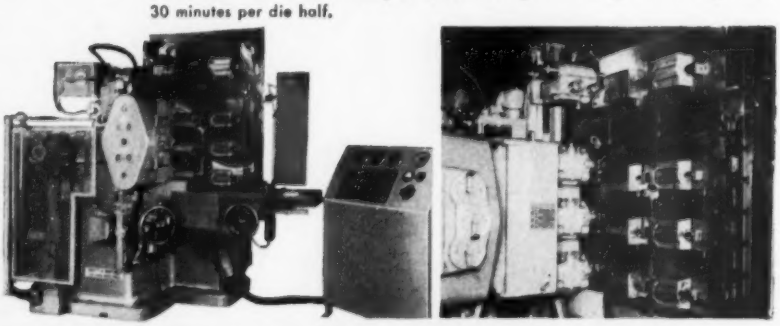
PRATT & WHITNEY

HERE IS THE COMPLETE (?) METHOD FOR MASS-

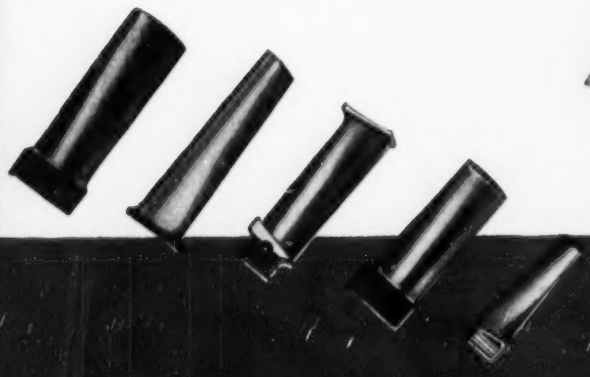
JET BLADE FORGING DIES



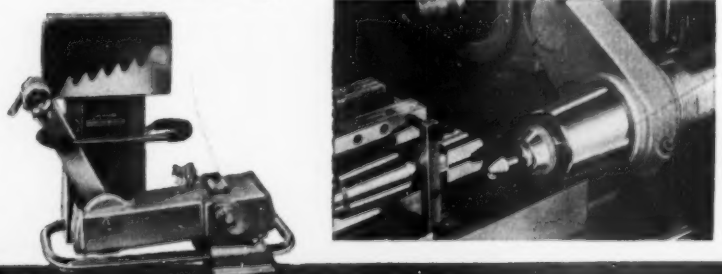
1 **ROUGHING DIE BLOCKS with the PRATT & WHITNEY-KELLER MACHINE** This P&W, Type BL-3620, 3-Spindle Keller Machine is performing the roughing operation on three male die halves at once; the female halves are similarly handled. Average machining time is only about 30 minutes per die half.



FINISHING JET BLADES



1 **FINISHING THE FIR TREE FORM on ROOT SECTIONS or BLADE CARRIERS with wheels formed on the PRATT & WHITNEY DIAFORM Wheel Forming Attachment** The fir tree form for this blade carrier is being ground with a wheel that was accurately formed to "tenths" in a few minutes with a Pratt & Whitney Diaform Wheel Forming Attachment. Grinding wheels for root sections are formed with equal speed and accuracy.



It's Logical to Look to

PRATT & WHITNEY

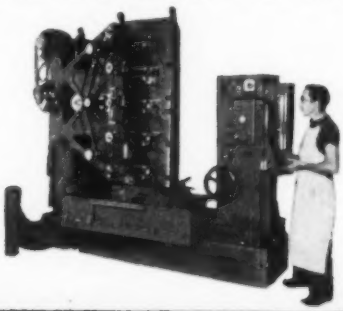
This example illustrates how a part of the diversified Pratt & Whitney Machine Tool line — backed up by P&W Gage and Cutting Tool Engineering Service — can break a critical production bottleneck. The jet blade production method shown here has been described by manufacturers using it as, "... by far the most accurate." What P&W has done for jet blade production it can do for your tough manufacturing problems.

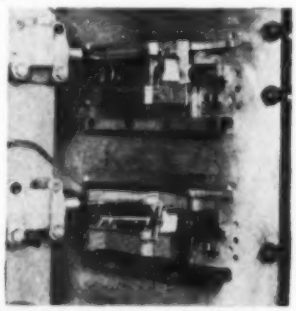
If you would like complete information about any of the equipment shown here — or if we can help you to solve a specific problem — write on your Company letterhead to the Pratt & Whitney Branch Office nearest you, or direct to West Hartford.

MEANS RESULTS

PRODUCING AND FINISHING TURBINE BLADE AIRFOILS

2 FINISHING DIE BLOCKS TO ± .002 INCHES with the PRATT & WHITNEY AUTOMATIC DUPLICATING MACHINE The 4-Spindle Pratt & Whitney Automatic Duplicating Machine is finish machining a set of four female die halves for a deeply curved turbine bucket. Hand polishing is needed only to remove mill marks; no hand correction of airfoil shape is required. Average machining time is just over 30 minutes per die half.



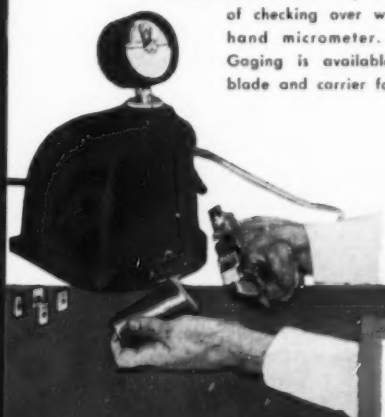


3 CORRECTING DIES AFTER HARDENING

Dies are often unavoidably distorted in hardening to the usual Rockwell "C" 60-63. Since P&W Kellerflex Carbide Burs are used in this machine, these dies can easily be replaced in the P&W Automatic Duplicator and re-cut if necessary.

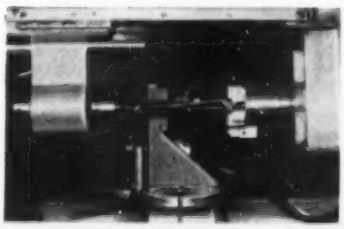
2 GAGING FIR TREE FORMS with the PRATT & WHITNEY AIR-O-LIMIT GAGE

Checking fir tree forms for pitch diameter with this P&W Air-O-Limit Gage is far faster and more reliable than the previous method of checking over wires with a hand micrometer. Air-O-Limit Gaging is available for both blade and carrier forms.



3 FINISH GRINDING AIRFOIL SECTIONS TO ± .003 INCHES PRATT & WHITNEY TURBINE BLADE AIRFOIL GRINDER

The *entire* twisted and irregular airfoil section of this blade—including leading and trailing edges—is being ground in a single automatic operation on a P&W Airfoil Grinder. A fine finish with closely maintained tolerances is produced.



PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U. S. A.

First Choice P&W *for Accuracy*

Branch Offices: BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DALLAS (The Strong Co.) • DETROIT • HOUSTON (The Strong Co.) LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROCHESTER • SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., WEST HARTFORD

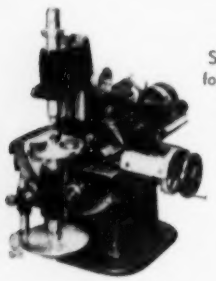
MACHINE TOOLS • CUTTING TOOLS • GAGES

From the watchmaker's "pointing machine" to the most modern SIP jig borer

1900

As early as 1912 the SIP catalogue contained already a screw set "Pointing Machine" which at that time was claimed to be "of very convenient use for watchmaking and all works where it is necessary to ensure the exact location of a series of points distributed in a plane".

Nobody could then visualize that this somewhat rudimentary apparatus carried in itself the germ of a machine tool which was to revolutionize tool room and manufacturing methods by setting a new standard of precision and ensuring the perfect interchangeability of mechanical parts produced in large batches.



MP-1
Small jig borer for watchmakers

1919

In fact, it embodied already the basic measuring principle of the coordinate system which is still to be found nowadays in all jig boring machines and which constitutes the ideal means for locating holes accurately.

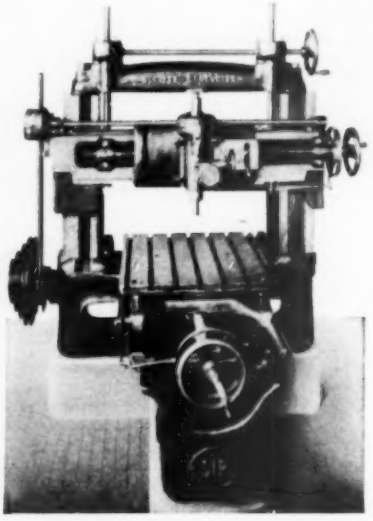
Swiss watchmakers asked then for a machine designed to meet their specific requirements and, in 1919, the model MP-1 illustrated on the left was marketed. Precision screws, provided with automatic pitch correctors, were used for the measurement of the coordinates, with a guaranteed setting accuracy of .00008 in.

Very soon the idea was conceived of extending the field of use of the jig borer to the mechanical industry and, in 1921, the model MP-4 was completed. It was of planer-type design and incorporated a boring head containing a spindle running at a maximum speed of 320 r.p.m. with a boring capacity of 3 in.

In spite of its primitive aspect, it was of sound design. Besides, the first customers who bought it were quite enthusiastic about its potentialities.

Two years later, another machine of larger dimensions and more respectable appearance, the MP-5, was built. Its measuring range was 32 × 24 in. and the guaranteed setting accuracy .0004 in. The Ford Motor Company of Detroit placed a first order for several machines of this type which are still in use to-day. They were subsequently to buy twenty-six SIP Jig Borers.

1921

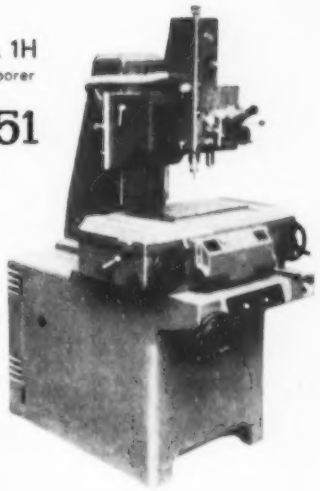


MP-4
First industrial jig borer model

A 14

No. 1H
Optically set jig borer

1951



New works had to be erected to cope with the growing demand for SIP Jig Borers. Further models of larger capacity and higher accuracy were developed: MP-5, MP-6, MP-7, etc. They were shipped to all industrial countries and made the name of SIP known the world over.

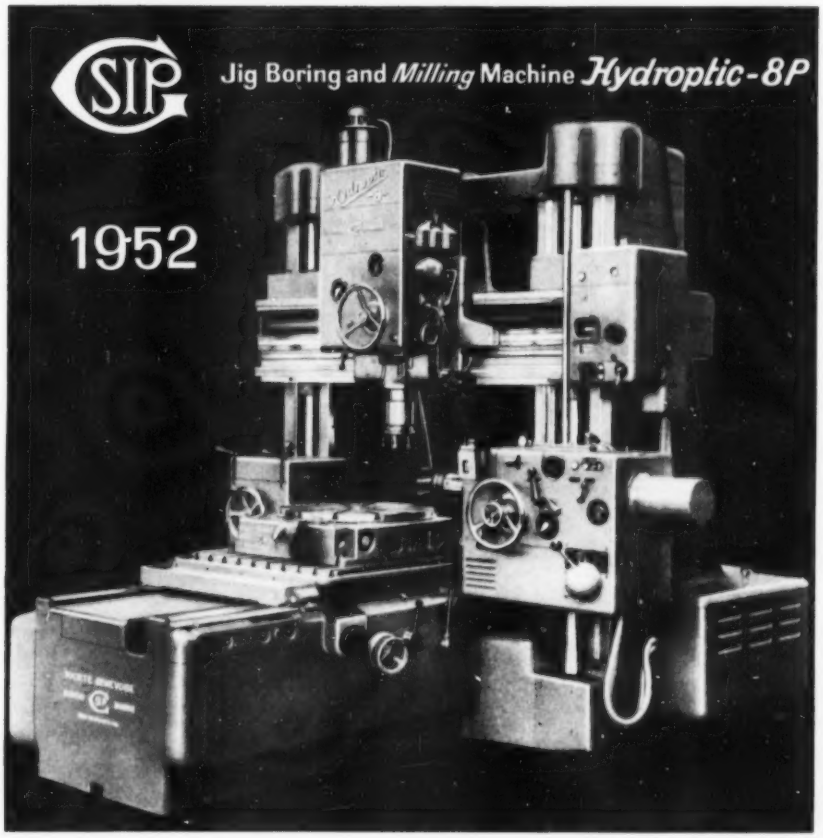
More powerful spindle heads and increased rigidity and flexibility permitted quicker operation so that, rapidly, these machines were not only used in the tool room, but called upon for production work in the machine shop.

● ● ● ● ● ● ● ● ● ● ● ● ● ●

SIP

Jig Boring and *Milling* Machine *Hydroptic-8P*

1952



The main function of the jig borer was up to that time to drill holes exactly at the prescribed place. The idea of substituting

standard scales

to the lead screws for coordinate location was then put forth. After years of painstaking research and trial work, a new goal was achieved by the creation of the "Hydroptic" Jig Boring and Milling Machine which solved the problem of *milling* flat surfaces and *boring* holes in accurate relation to each other. The optical measuring system comprising built-in

standard scales

enclosed in the table and the spindle saddle was a radical departure from all known setting methods.

The Société Genevoise build to-day, among other machines, five models of high speed jig boring and milling machines incorporating the same measuring system which has carried precision milling and boring a long step forward. Their working capacities range from 8×8 in. up to 55 × 28 in., including the three-coordinate machine "Hydroptic-8P" illustrated above which is the most important jig borer yet produced, with a guaranteed setting accuracy of .0002 in. Complete freedom of wear of the measuring elements ensures the **absolute permanence of the initial accuracy.**

Furthermore, projection screens are now supplied instead of the former viewing microscopes. They provide unexcelled operating convenience and add to the high potentialities of the SIP Jig Borers.

REPRESENTATIVE FOR U.S.A. AND CANADA:

AMERICAN SIP CORPORATION

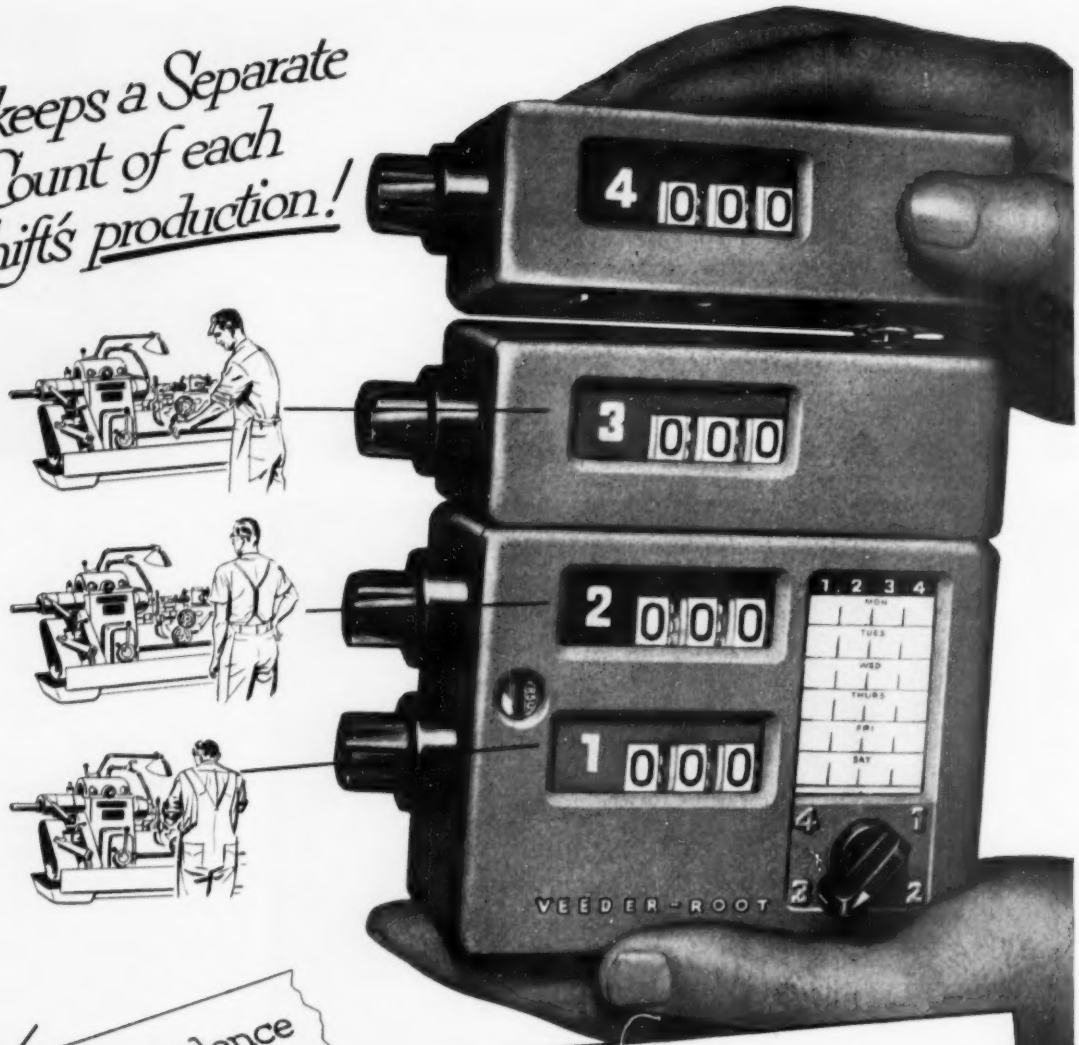
HIGH PRECISION MACHINE TOOLS AND MEASURING EQUIPMENT

100 East 42nd Street NEW YORK 17, N.Y.

SIP

A14

It keeps a Separate Count of each shift's production!



Added Evidence that

Everyone Can Count on VEEDER-ROOT

Here's a counter whose "count-ability" challenges your imagination. For this counter records, on a separate counting unit, the production of 1, 2, 3, or more shifts. The additional 4th unit can be used as a run or batch counter. These Veeder-Root 2-3-4 Convertible Shift Counters are applicable to a wide variety of production machines, to count in practically any unit desired . . . revs, strokes, pieces, or what do *you* want to count? *Write:*

VEEDER-ROOT INCORPORATED
"The Name That Counts"
HARTFORD 2, CONNECTICUT
New York 19, N. Y. • Chicago 6, Ill. • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland
Offices and Agents in Principal Cities

It MUST have been good!

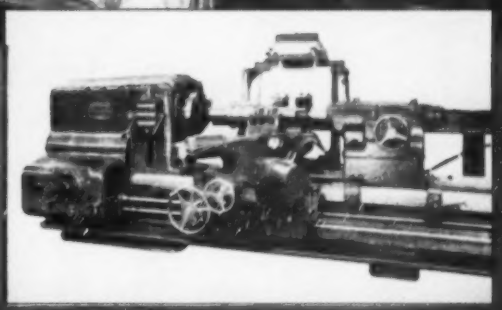
There are times when expressions speak louder than words.

Here's a group of distinguished steel mill roll executives watching a demonstration on a 26" Capacity "AMERICAN" Hydraulic Roll Lathe—judge for yourself whether or not they are satisfied with what they saw.

These machines are performing "miracles" in savings in many of the best known roll shops in the country. They have introduced a brand new machining technique that has revolutionized the art of roll turning. They reproduce work shapes from a template faithfully and accurately not only on steel mill roll bodies and necks, but on such work as spindles, motor shafts, valve stems, step shafts, piston rods, axles and a wide variety of chucking work having irregular contours.

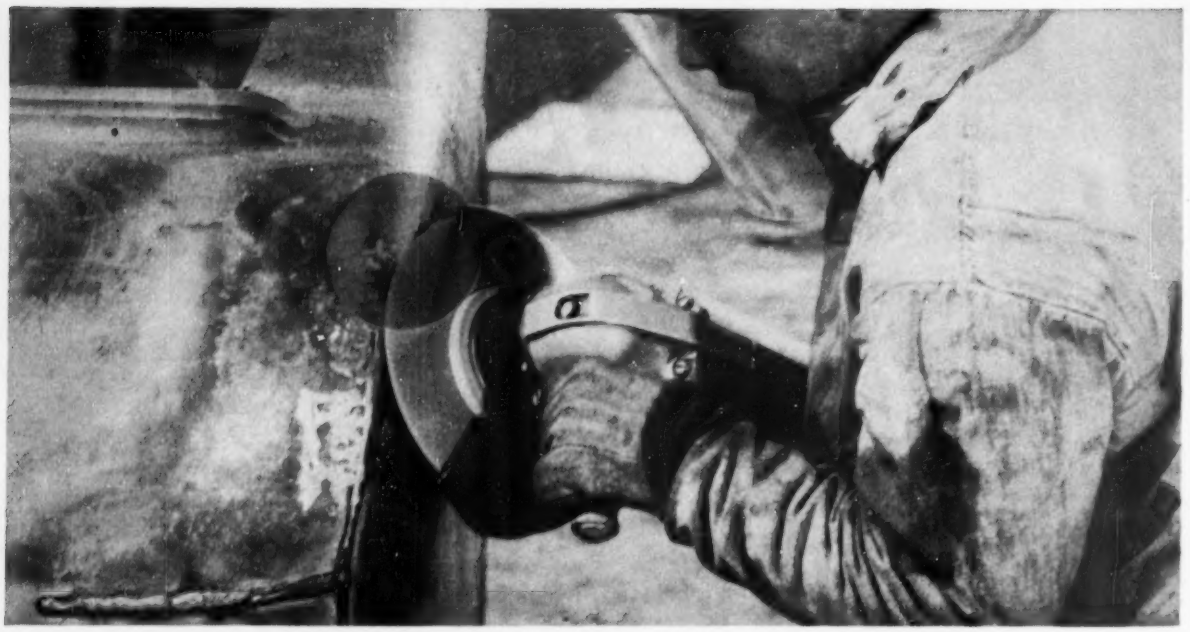
Evidence from hundreds of installations proves beyond a shadow of a doubt their leadership as top-flight cost reducers. Was there ever a time when cost reduction was more urgently needed?

If it's proof you want just drop us a line—no obligation.



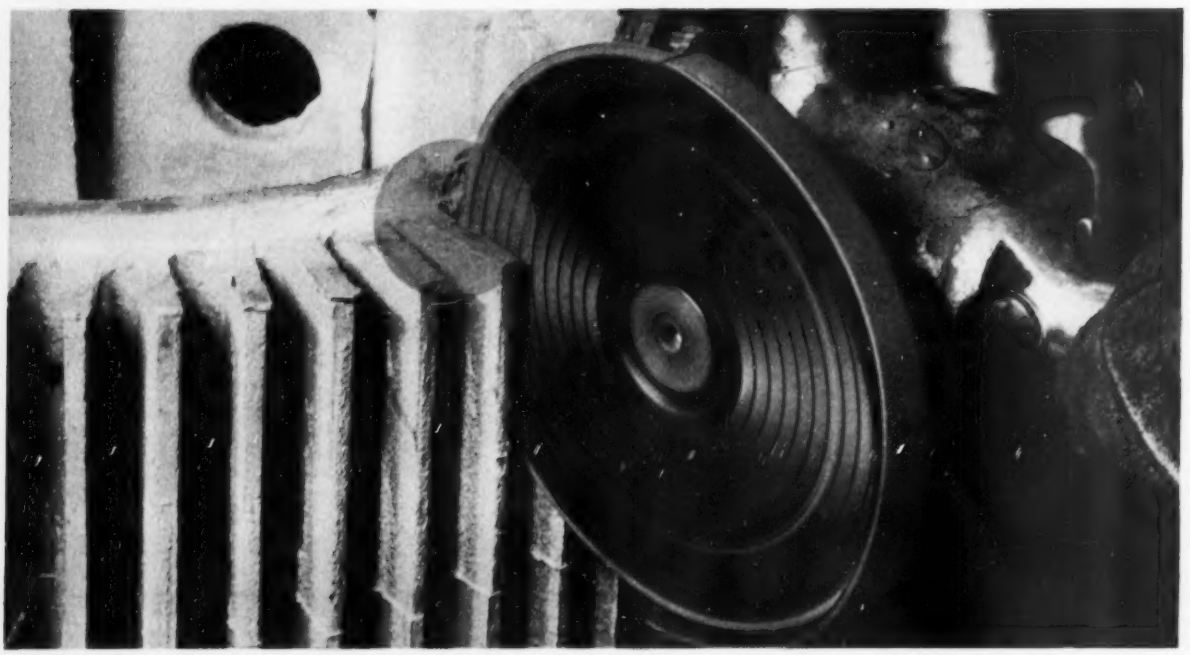
THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS



BLENDING IN A WELDED CORNER is a job you can do faster and better with a Norton BFR semi-flexible wheel.

Here's your "TOUCH OF GOLD" team for more economical portable grinding



CLEANING OUT FINS of a compressor casting is a hard job made easy — when you use a Norton BD rigid wheel.

There's gold in hub-wheel grinding — the real cost-cutting, value-adding "Touch of Gold" that you can bring to job after job with these faster, safer Norton Reinforced Hub Wheels!

They're the long popular Norton BD rigid wheel and the newer Norton BFR semi-flexible wheel. Beyond any doubt they're the most useful pair ever built for portable grinding. They're lighter and easier to handle than cup wheels, longer lasting than coated abrasive discs, and more versatile than either.

Built-in speed and safety

Made of aluminum oxide and silicon carbide abrasives, resinoid bonded, both the BFR and BD wheels cut fast and cool, without spalling or loading. And for tops in safety, they're reinforced with nylon webbing. Even if breakage occurs this strong web keeps pieces from flying off in all directions, until the machine can be stopped.

Covering a wide job range

Where finish is most important — especially for blending corners and contours — you'll like the way the semi-flexible BFR wheel hugs the work. Where stock removal is the main factor, you'll prefer the heavier duty, rigid BD wheel. And with both these wheels working for you, you have a grinding team that will help you turn out better products faster and easier — adding the profit-boosting "Touch of Gold" to countless every-day jobs.

NEW! . . . The Norton BF Wheel For Light Finishing

Meet the latest Norton development for your lighter finishing jobs. Basically, the new BF wheel is built like the BFR wheel but is designed especially for periphery grinding. You'll find its flexibility in the softer grades (G and I) ideal for blending and smoothing curved surfaces and corners. The hardest grade (K) is more rigid — best for light welds and sharp edge applications. In all grades it tends to finish as it cuts.

Like the BFR and BD wheels, the new BF wheel cuts fast and free and has a high safety factor. Like them, too, it features versatility, covering a range of usefulness that includes finishing stainless steel welds, deburring metal parts such as stampings and removing gates and fins from molded plastics. Let the new BF wheel add "The Touch of Gold" to many of your own light-duty grinding jobs.

GET YOUR NORTON DISTRIBUTOR TO DEMONSTRATE

these versatile Norton wheels in your shop. He'll be glad to help you on any grinding problem and, if necessary, he'll call in a Norton Abrasive Engineer. Or write to NORTON COMPANY, Worcester 6, Mass. for descriptive folder #225. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

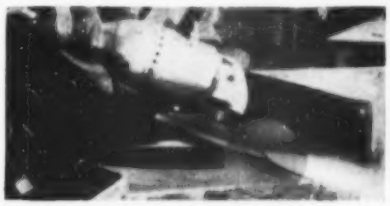
W-1470

NORTON
ABRASIVES

Making better products to make other products better

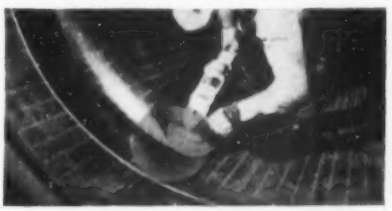
Put the value-adding "TOUCH OF GOLD" into jobs like these

Cutting down a heavy weld — rigid BD



Blending a welded radius — semi-flexible BFR

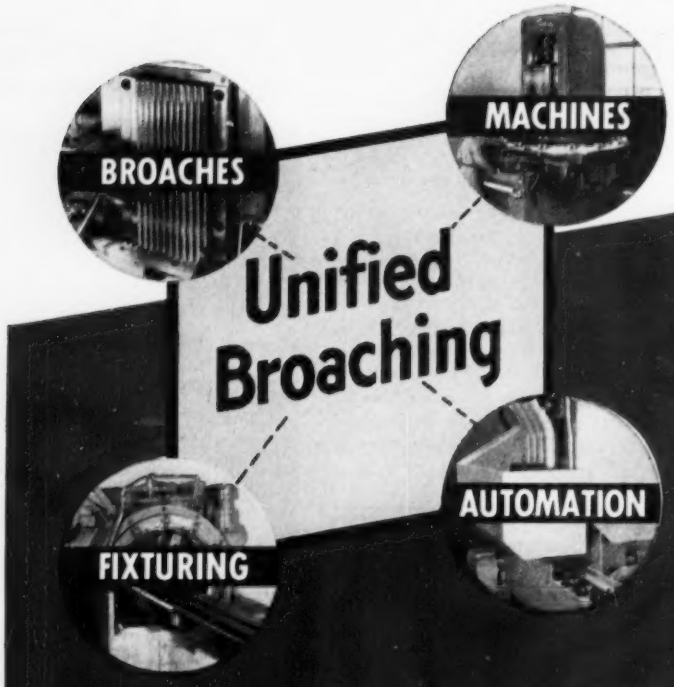
Smoothing a flame-cut edge — rigid BD



Grinding welds in a fabricated cone — semi-flexible BFR

Smoothing a weld seam — semi-flexible BFR

Notching risers on gray iron castings — either type

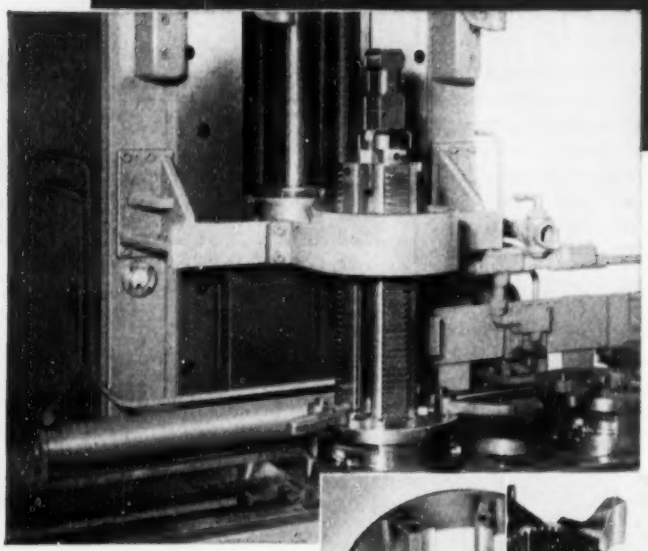


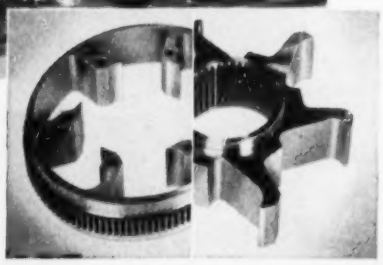
The New Trend...

the COLONIAL method

At Colonial, experience, imagination and competence are applied

1. to the design and manufacture of each of the individual components of a complete broaching installation, and
2. to the effective combining of ALL components into a completely UNIFIED BROACHING installation—making them work as a "team."





3 Colonials Broach Intricate Aero Parts

Three Colonial broaching machines rough and finish broach these two mating aircraft engine parts. Six internal contours on the body are broached on a 15-ton Model RD pull-down (illustrated). The spider's external contours are broached on a Model RS 6-ton single ram and internal involute splines on a 15-ton Model RD pull-down machine.

Machines, broaches, fixtures, etc., were all designed by Colonial as a UNIFIED BROACHING INSTALLATION.

WHAT'S AHEAD IN BROACHING?

Keep up with the latest developments: Read "Broaching News". We will be glad to see you get it regularly if you will drop us a line on your company letterhead.

PIONEERS OF H.S.S. BROACHING

COLONIAL BROACH CO. DETROIT 13

BULLARD

MANUFACTURERS OF MACHINE TOOLS

Haylift for Starving Snow Bound Livestock — Fallon, Nevada

Wide World Photo

The Invisible Background of Industrial Progress

Few people realize the full extent of Industrial America's free enterprise and ingenuity. Modern engineering and manufacturing methods provide such planes as illustrated for air lifts in this country and abroad. Shown here is a Haylift for Starving Snow Bound Livestock at Fallon, Nevada.

Flying Box Cars are built for carrying heavier-than-usual loads and are normally used by the armed services for transporting bulky and heavy military equipment as well as personnel. These planes are capable of medium-long flights and are suited to operate under adverse weather conditions. Their ability to make small area landings and take-offs, and the speed and ease with which large heavy types of cargo are loaded and unloaded make them ideal for flights for the relief of snow bound, flood stricken and emergency areas.

In "The Invisible Background of Industrial Progress" Bullard's ★ *Modern Machine Tools* play an important part in manufacturing and the maintenance of today's air arm.

★ *For greater manufacturing economy REFER to next page*

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

BULLARD MACHINE TOOLS FOR GREATER MANUFACTURING ECONOMY

16"—6 spindle type "D" Mult-Au-Matic for production of aeroplane motor forged Cylinder Heads showing sixth and loading stations.

Bullard Mult-Au-Matics have become a byword in the fields of high-speed production and manufacturing economy. Built with a backbone for sustained endurance they provide an economical manufacturing method easily adaptable to many classes of work.

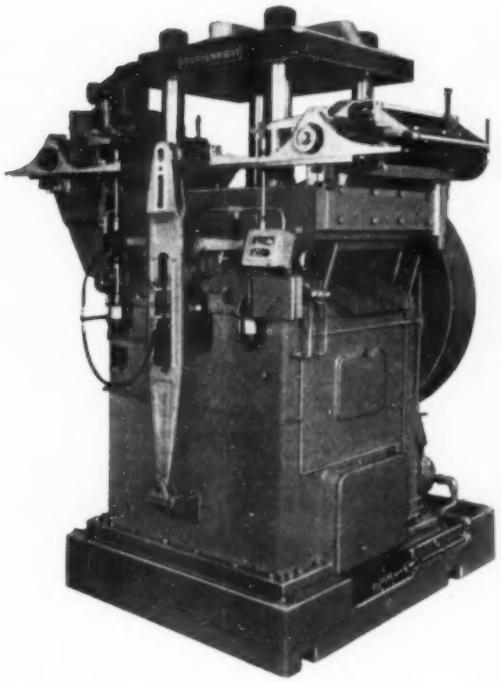
These machines are outstanding in the automotive industry, which includes many products such as tractors, aeroplane engines, marine motors and a host of other items. The flexibility of Mult-Au-Matic provides for change-over from one design of a part to a new design of the same part or from one part to another of different design without basic change to the machine other than tooling and versatile changes of feeds, speeds and head adjustments.

BULLARD

Time saved is money earned. Write now for information.

THE BULLARD COMPANY BRIDGEPORT 2, CONNECTICUT

A PROFIT WITH EVERY STROKE



Our customers say that. It figures. One Dieing Machine does the work of five to ten conventional stamping presses. One stroke—a complete part. One inspection. One trip for parts removal. Speed—you can pull out the throttle. Die life—longer for two reasons. (1) Stability, minimum vibration, extreme precision of tools alignment. (2) Dies take less of a beating; less metal needs to be removed for sharpening. Our men can give you the whole Dieing Machine story. If you want to cut costs, now's the time to talk to one of them—a note from you will have an H & W man on deck promptly.

NEW CATALOG Up-to-the-minute facts on Dieing Machines. Capacities now range from 25 tons to 2500 tons. Catalog gives specifications up to 400-ton machine. Write Henry & Wright, 481 Windsor St., Hartford, Connecticut.

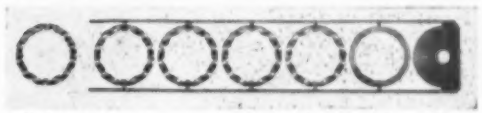
HENRY & WRIGHT

DIVISION OF EMHART MFG. CO.

HARTFORD 1, CONNECTICUT

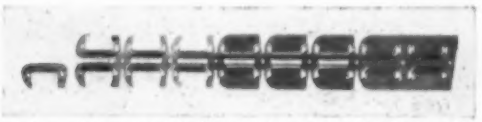
TYPICAL JOBS THAT SHOW A PROFIT AT EVERY STROKE

Automotive stamping produced complete per stroke from $\frac{3}{32}$" thick by 13" wide hot rolled steel in coils on 200-ton Dieing Machine, single gear type, equipped with progressive die. Speed approximately 45 strokes per minute.



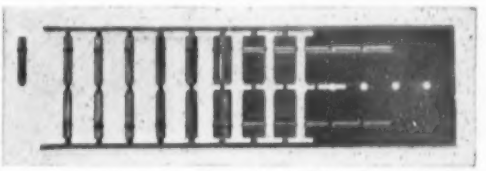
Ball bearing retainer produced complete in 75-ton Dieing Machine operating at speed of 95 strokes per minute. Made from $4\frac{3}{8}$" wide by .034" thick cold rolled steel.

Ferrule. One completed piece produced per stroke in 50-ton Dieing Machine operating at speed of 90 strokes per minute. Made from $\frac{9}{16}$" diameter by $\frac{7}{8}$" long by .030" thick cold rolled steel.



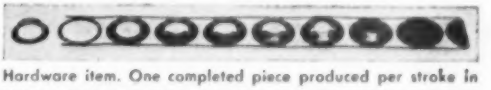
C-Clamp Frame. Both halves produced complete in 150-ton Dieing Machine operating at speed of 65 strokes per minute. Material—cold rolled steel .086" by $4\frac{3}{8}$" wide.

Support bracket produced complete one per stroke in 150-ton Dieing Machine operating at speed of 60 strokes per minute. Made from .062" thick by $7\frac{1}{4}$" wide cold rolled steel.



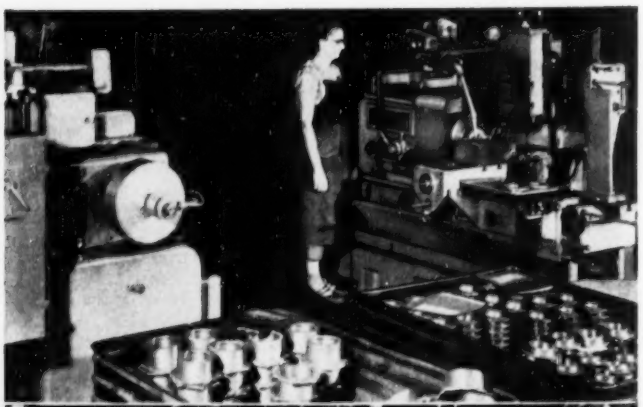
Radio tube prong produced complete in 25-ton Dieing Machine at rate of 450 pieces per minute. Made from brass .012" by $1\frac{7}{16}$" wide.

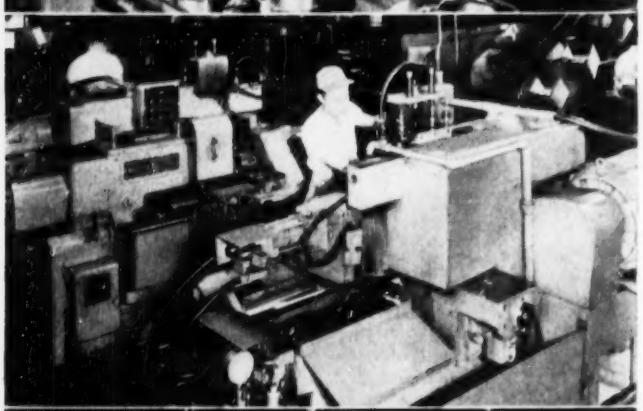
Bathroom fixture produced in 60-ton Dieing Machine operating at speed of 100 strokes per minute. Made from .032" thick by $1\frac{3}{4}$" wide cold rolled steel.

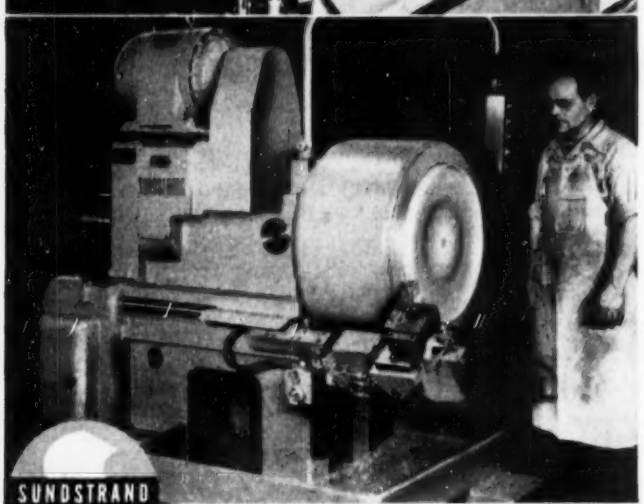


Hardware item. One completed piece produced per stroke in 100-ton Dieing Machine operating at speed of 75 strokes per minute. Made from 3" wide by .040" thick cold rolled steel.

Why SUNDSTRAND AUTOMATIC LATHES CAN INCREASE YOUR PRODUCTION *on jobs like these...*







SUNDSTRAND

① Small Lot Turning

The two Model 8A Automatic Lathes installed with facing fronts, as shown at left, are part of a modern Sundstrand turning battery. Thirty-two different parts of cast iron and steel are turned in lot sizes varying from 150 to 200 pieces per lot. Production increase is as high as from 40 to 150 parts per hour compared to former method.

Because of the ease and simplicity of operating Sundstrand Automatic Lathes, one operator is able to handle 2 machines. If you have turning problems consult a Sundstrand methods engineer. There is no obligation for this service.

② Long Run Turning

Here's fast, profitable machining of a pump body part requiring turning, facing, chamfering, drilling, and counter-boring operations. All are performed on a Model 8A Sundstrand Automatic Lathe with multiple tooling and automatic cycling. Two of many features contribute to the efficiency of this installation. First, the machine is automatic and completes a rough and finish cycle, once started by the operator. This enables one operator to run two machines and produce 132 bodies per hour instead of 40 per hour as obtained with the previous equipment and method.

③ Special Turning

The Sundstrand special short bed lathe illustrated is used for turning and facing the open end of a washing machine tub. It has a special tool block guided by a roller that rides against the O.D. of the tub and moves the tool to conform with any irregularities in the tub diameter. The short bed permits easy end loading and unloading to maintain a production of approximately 85 pieces per hour.

The prominent manufacturer who installed this and several other Sundstrand Automatic Lathes found he could do more work with fewer machines by using Sundstrand Automatic Lathes and "Engineered Production" Service.

RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

SOME OF THE DESIGN FEATURES THAT MAKE THIS PRODUCTION POSSIBLE

Greater Horsepower

All new Sundstrand Automatic Lathes have been redesigned for greater rigidity and larger spindle drive motors. They have ample power for use of carbide cutting tools and are capable of doing more work.

Wider Speed Range

Spindle speed range ratios have been increased to 30 to 1 to obtain maximum in cutting efficiency over a wider range of sizes of parts and material. The spindle unit is equipped with two driving gear centers, which increase the range between high and low spindle speeds. In addition, four speed changes can be obtained from one set of gears instead of the usual two.

Wider Feed Range

A wider feed range has been provided to enable the handling of a greater range of parts and materials at maximum cutting efficiency. The New Models 4A, 8A, and 12A have a ratio of 18 to 1 between high and low feeds — Model 16 has an even greater range.

Greater Carriage Adjustment

Both front and rear carriage of the latest Sundstrand Automatic Lathes are adjustable full length between headstock and tailstock centers — another important new feature.

Faster Set-Up

Convenient location of pick-off gears for changing spindle speeds and front and rear carriage feeds is provided. Feed and speed chart and pick-off gear storage compartment are readily accessible for quick set-up or changeover.

Quick Cycle Changeover

Complete control of all cycles is provided by adjustment of dogs on a disk. Making cams is eliminated. Changing position of dogs on disk changes length of rapid approach, feed and rapid return strokes — enables operator to set up cycle quickly and change over from one job to another easily.

Automatic De-Clutching

All new models have been provided with automatic de-clutching between spindle and spindle motor with self-adjusting magnetic clutch and brake for quick stopping of spindle rotation.

Screw Feed to Front Carriage

All new Sundstrand Automatic Lathes have screw instead of rack feed to front carriage — resulting in fine finish and long tool life.

4 Models Cover HP Range of 3 to 75 HP

	MODEL 4A	MODEL 8A	MODEL 12A	MODEL 16
SPINDLE MOTOR	3 to 7½ HP	10 to 25 HP	20 to 50 HP	50 to 75 HP
SPEED RANGE (Type A) (Type B)	60 to 1800 RPM 120 to 3600 RPM	40 to 1200 RPM 60 to 1800 RPM	30 to 900 RPM 40 to 1200 RPM	15 to 750 RPM
FEED RANGE	.003 to .048 IPR.	.004 to .070 IPR	.004 to .070 IPR	.0025 to .100 IPR
FRONT CARRIAGE: Longitudinal feed with angular feed-in, max. Swing over cross slide, max. Rapid traverse rate	 5″ 8¾″ 275″	 6″ 12½″ 250″	 8″ 15¼″ 250″	 12″ 17″ 250″
REAR SLIDE: Max. Stroke	4″	5½″	6½″	8″
LENGTH BETWEEN CENTERS	15, 24 & 36″	24, 36, 48 & 60″.	24, 36, 48 & 60″	36, 60 & 84″

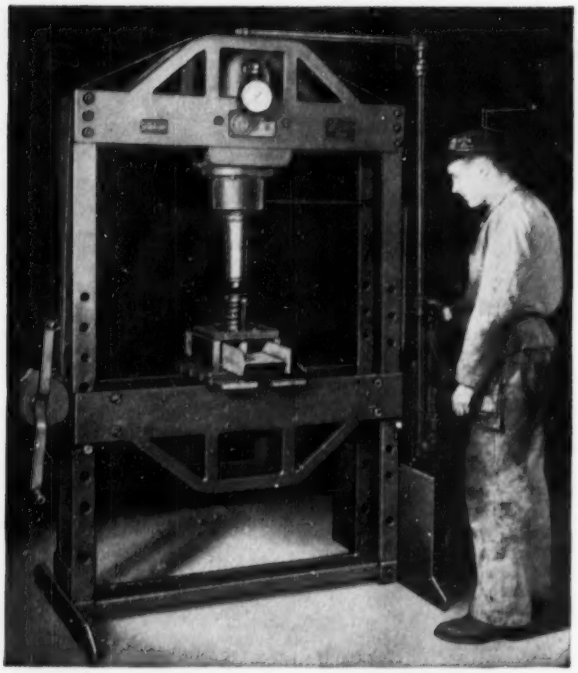
FREE *ADDITIONAL DATA*

The complete new line of Sundstrand Automatic Lathes includes the Models 4A, 8A, 12A and 16 ranging from 3 to 75 HP. Write for complete information on these new machines today. Ask for bulletin 129.

SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2533 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES



KRW HYDRAULIC PRESS DOES 4 VITAL JOBS ON POLE-SETTING DERRICKS

BATAVIA METAL CORP. bought a K. R. Wilson 75 ton motor-driven Hydraulic Press two years ago to perform a few routine operations on their pole-setting derricks (derrick shown on telephone truck below). But they soon found that the amazing versatility of the press—the ease and speed with which it can be converted from one set-up to another, makes it a natural for all kinds of trouble shooting. Below are just a few of the jobs their KRW press does.

1. SETTING RIVETS in side legs and front braces of pole-setting derricks. Thanks to their KRW press, Batavia Metal has eliminated loosening of rivets and the resulting loss of valuable production time.

2. COSTS CUT 33⅓% The center hole on derrick foot plates must be 1½" in diameter, flanked by two 11/16" holes. Originally the company drilled three 11/16" holes on a small drill press, then moved the plates to the machine shop where the center eye-bolt hole was reamed out to 1½" diameter. Use of a simple die plus the KRW press produces all three holes in one stroke and eliminates the drilling and reaming operations, cutting costs by more than ⅓.

3. FORMING BRACKET U'S for derrick mountings on front of trucks and riveting the lower sections of front mountings are two more jobs done quickly, accurately and efficiently on the KRW Hydraulic Press.

4. FORMING BASES for rachet jacks and restoring proper contour to various castings which sometimes warp as they cool are also regular assignments for this KRW press. Company officials tell us that their KRW Hydraulic press is in use the greater part of every working day!

Any pressing problems in your plant? Check with K. R. Wilson for the right press to do the job. KRW Hydraulic Presses come in one, two and three cylinder models; 25 to 150 ton capacities; hand operated, air operated or motor driven. For facts and prices contact your machinery dealer or write, wire or phone Dep't. 11.

***IMMEDIATE DELIVERY** on type of press shown above up to 75 ton capacity, hand, air or motor driven.*

K. R. WILSON

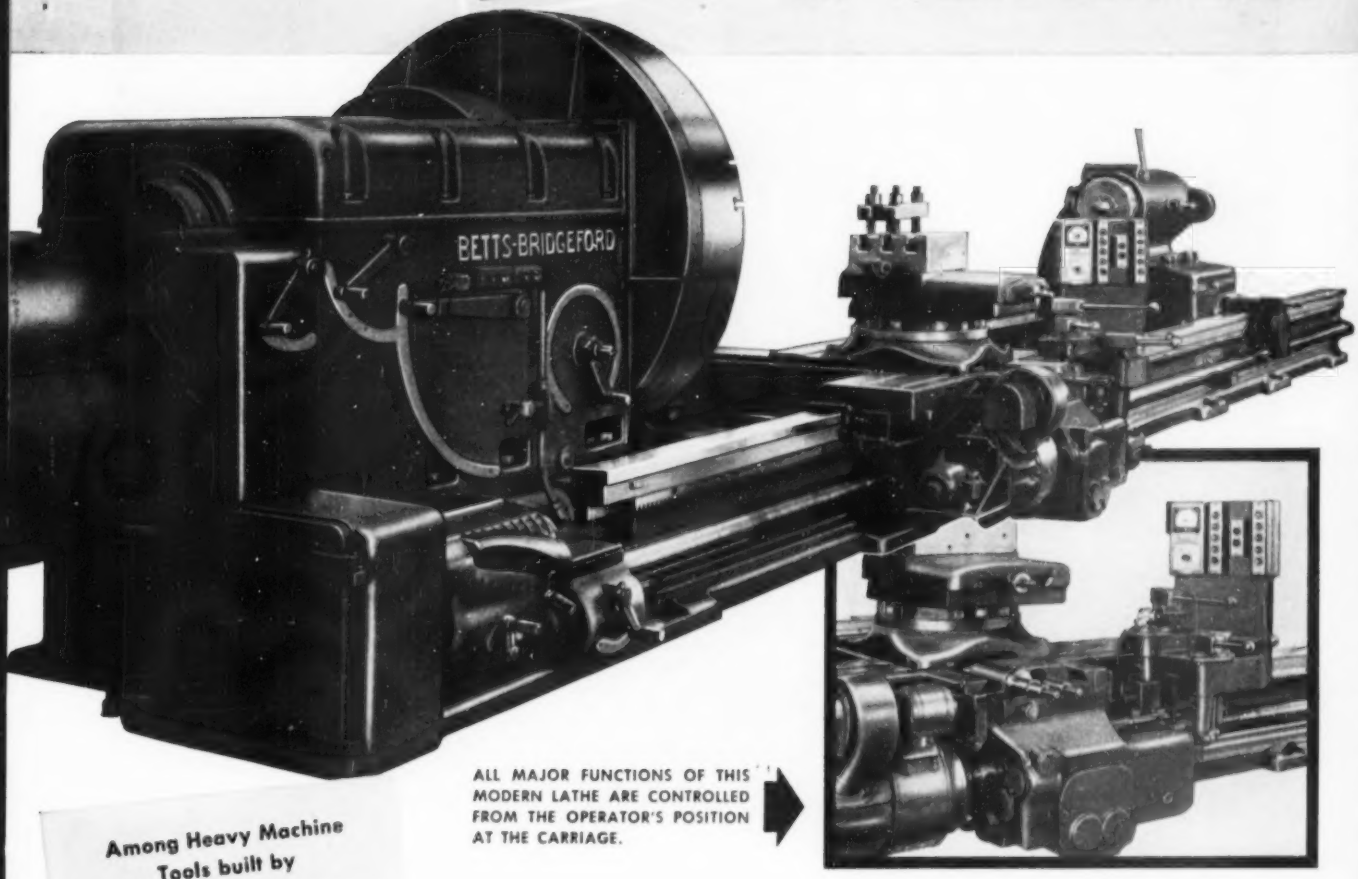
215 MAIN STREET BUFFALO 3, N. Y.

DESIGNERS AND BUILDERS OF HYDRAULIC PRESSES TO SOLVE ANY METALWORKING PROBLEMS

BETTS-BRIDGEFORD

ELECTRONIC FEED

60" HEAVY DUTY LATHE



ALL MAJOR FUNCTIONS OF THIS MODERN LATHE ARE CONTROLLED FROM THE OPERATOR'S POSITION AT THE CARRIAGE.

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

- Wide speed range permits use of either high speed steel or carbide tools.
- Feed and traverse functions entirely independent of thread cutting mechanism.
- Feed rate and cutting speed, within the range of their respective motors, are adjustable independently without interrupting the cut.
- Lead screw for thread cutting only.
- All anti-friction bearing headstock.
- Hardened steel bedways.
- Main drive motor speeds and feed and traverse functions are conveniently controlled from the operator's position at the carriage.
- Altogether, this modern lathe embodies the advanced features necessary to meet today's demand by industry for high production with greater accuracy and durability. Full information on this lathe or other Betts-Bridgeford Heavy Duty Lathes from 26" to 144" and larger will be furnished upon request.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

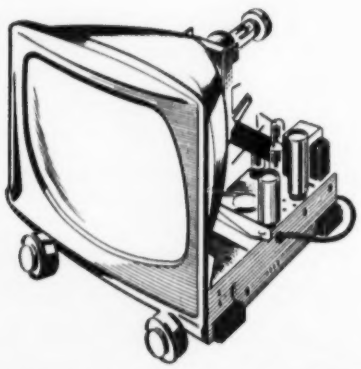
CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK

UNBRAKO SELF-LOCKING SOCKET SET SCREWS feature the following advantages: knurled cup point that won't work loose; accurate hex socket for nonslip, positive drive; fully formed threads—Class 3 fit; heat treated alloy steel for strength; standard sizes—# 4 to 1"—in a full range of lengths.



USE UNBRAKO SELF-LOCKING SOCKET SET SCREWS wherever ordinary cup point set screws are used . . . on radios, television sets and electronic equipment.

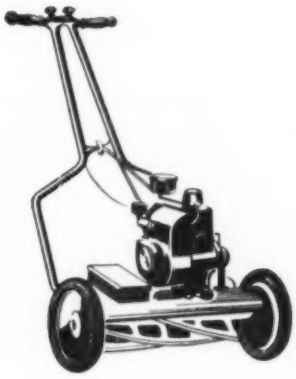
On refrigerators, washers, other household appliances

9 times out of 10 a standard UNBRAKO will do the job

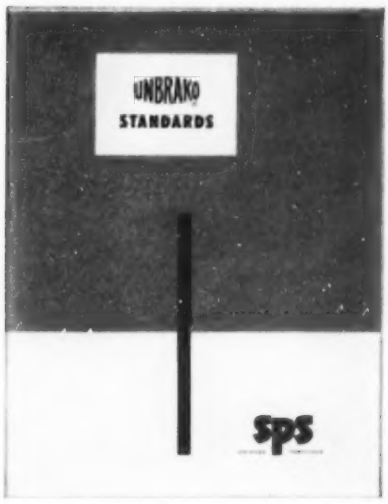
A special socket screw may not be necessary, a standard UNBRAKO usually does the same job—much cheaper. Your local industrial distributor stocks Standards. He gives immediate attention to your requirements, and such extras as special delivery to your plant. Write for a copy of UNBRAKO Standards. SPS, Jenkintown 1, Pa.

UNBRAKO® SOCKET SCREW DIVISION

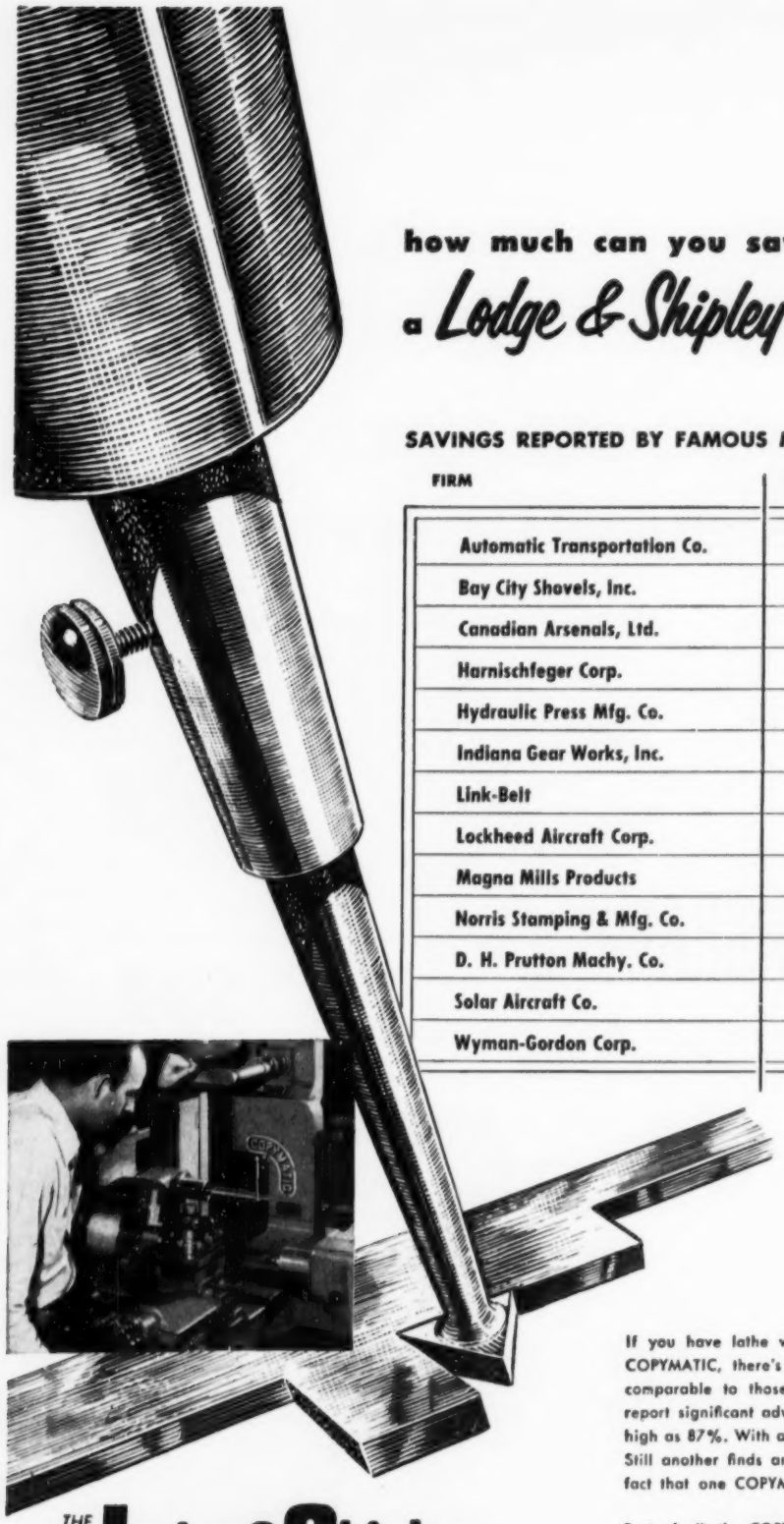
SPS
JENKINTOWN PENNSYLVANIA



On power mowers, power saws and other power tools.



UNBRAKO Standards—as listed in the SPS Catalog—are stocked by leading industrial distributors everywhere.



how much can you save with a Lodge & Shipley COPYMATIC

SAVINGS REPORTED BY FAMOUS MANUFACTURERS

FIRM	PART	TIME SAVINGS
Automatic Transportation Co.	Armature shaft	55%
Bay City Shovels, Inc.	Worm gear shaft	70%
Canadian Arsenals, Ltd.	Heavy spindle	60%
Harnischfeger Corp.	Pinion shaft	40%
Hydraulic Press Mfg. Co.	Valve parts	50%
Indiana Gear Works, Inc.	Helicopter gearing	50%
Link-Belt	Transmission shaft	50%
Lockheed Aircraft Corp.	Engine mount lug	87%
Magna Mills Products	Dural extrusion	33%
Norris Stamping & Mfg. Co.	Auto rim rolls	50%
D. H. Prutton Machy. Co.	Machine spindle	85%
Solar Aircraft Co.	Jet engine parts	22%
Wyman-Gordon Corp.	Aluminum extrusions	50%

If you have lathe work that's adaptable to the Lodge & Shipley COPYMATIC, there's no reason why you, too, can't enjoy savings comparable to those shown above. On every installation, owners report significant advantages. With one, it may be a time saving as high as 87%. With another, a production increase as much as 536%. Still another finds an overall saving of $14,000 in one year or the fact that one COPYMATIC replaced three older lathes.

Best of all, the COPYMATIC is so versatile, combining the speed of automatic duplication with the precision and adaptability of the famous Model X Lathe, practically any shop can use it profitably.

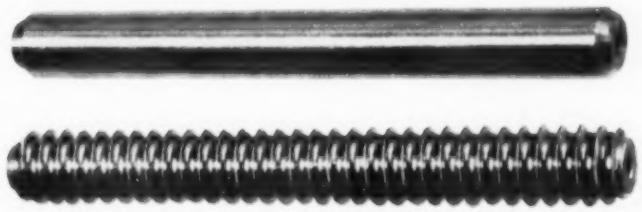
Write for detailed COPYMATIC case histories or a demonstration of your own parts on a COPYMATIC.

THE Lodge & Shipley COMPANY
MACHINE TOOL DIVISION • 3059 COLERAIN
CINCINNATI 25, OHIO

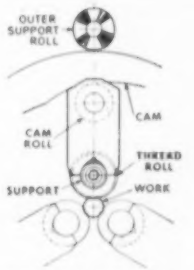
225,000 lead screws for ball track device at rate of

10 seconds per piece

on NAMCO HYDRAULIC FORM AND THREAD ROLLING MACHINE



This lead screw for ball track parts is approximately 9/16" diameter x 4-5/8" long, 7 pitch single lead, made from 8620 high alloy steel on a TR-1" Namco Roll Threader in lots of 50,000. Total 225,000. Production rate—10 seconds per piece.



This exclusive Namco design shows powerful straight-line-support, direct from behind the one piece circular cam through its slides to the work rolls. Elimination of linkages makes practical heavy feeds with high precision in fast cycle time.

Other mass producers of precision threaded and rolled forms such as aircraft dry seal fittings, class-4 motor studs, spark plugs, fine instrument screws demonstrate remarkable savings—in materials, quality and time.

The Namco TR-1" threader operates on either the plunge or feed through principle with either 2-roll heads for work 1/8 to 3/8" diameter or 3-roll heads for 3/8 to 1 1/2" diameter. Heads can be changed in less than 30 minutes, with no other machine alterations.

The feed through job illustrated is manually fed; hydraulic loaders and magazine feeds are also available to put production on a fully automatic basis and with unskilled labor.

This roll threading process guarantees a degree of uniform smoothness and Brinell surface hardness not commercially possible by any other means as thread cutting, milling or grinding. No chips to salvage.

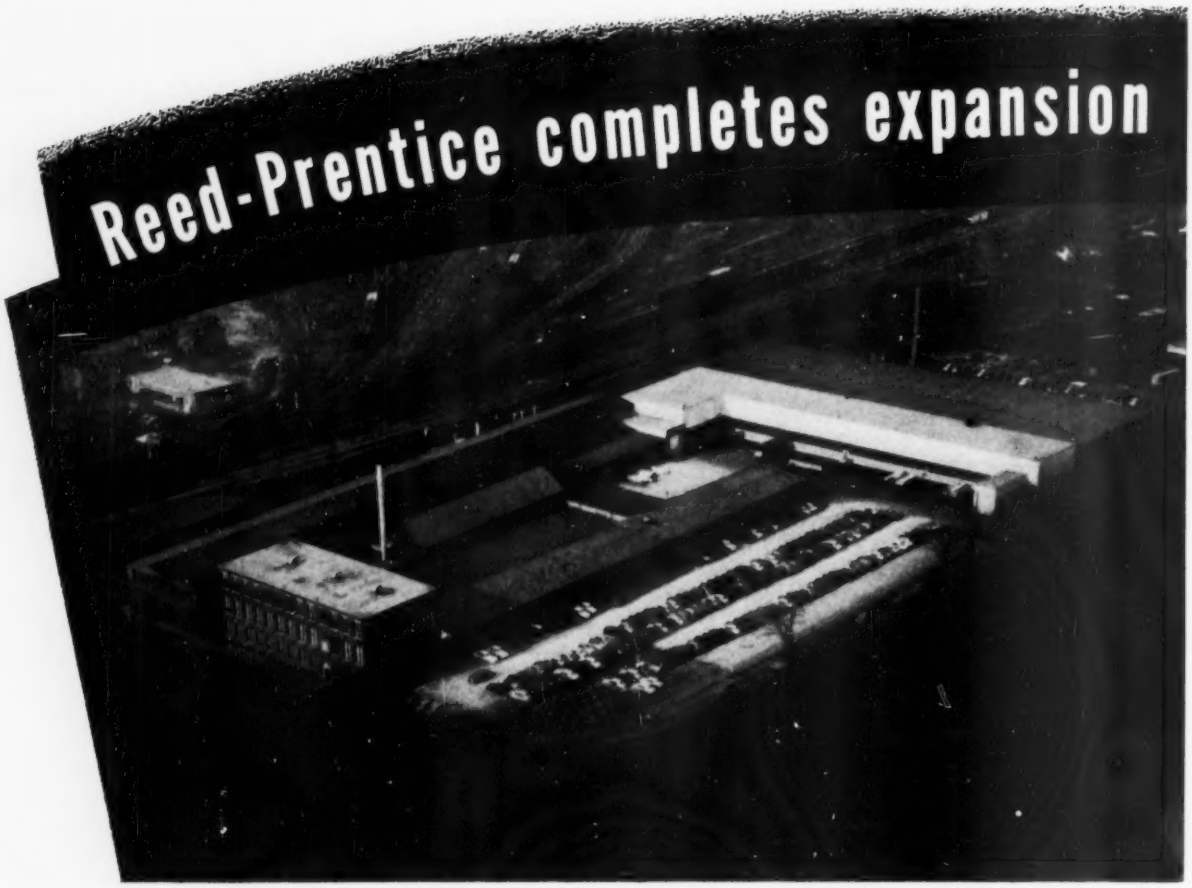
★ **Send us your samples—get specific facts. Catalog TR-49A.**

The NATIONAL ACME COMPANY

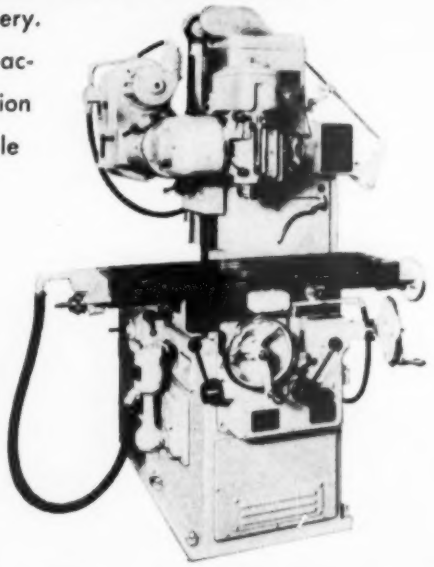
170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics, 1-4-6 and 8 Spindle —Hydraulic Thread Rolling Machines—Automatic Threading Dies and Taps—Limit, Motor Starter and Control Station Switches—Solenoids—Contract Manufacturing

Reed-Prentice completes expansion



★ The completion of a new factory building gives Reed-Prentice a total of 240,000 square feet devoted to manufacturing precision machinery. Our steady growth is attributable to the world-wide acceptance of Reed-Prentice machine tools, plastic injection molding presses, die casting machines and portable power chain saws.



12V MILLER

Reed-Prentice No. 12V is a multi-purpose universal head vertical miller. The 12V offers complete versatility through infinitely variable electronic feed and speed controls. It is ideal for machining molds, dies, jigs and fixtures and can be supplied with electronic duplicating attachment.

MACHINE TOOLS

REED-PRENTICE CORP.

WORCESTER MASS., U.S.A.

MAIN OFFICE: 677 Cambridge St., Worcester 4, Mass.

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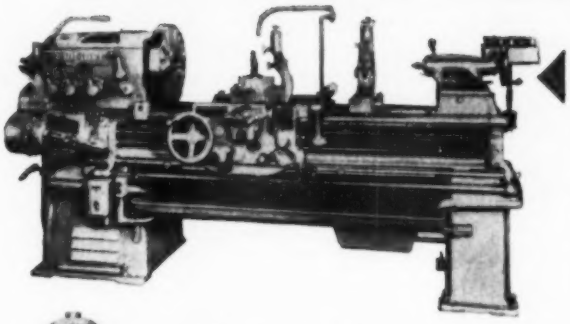
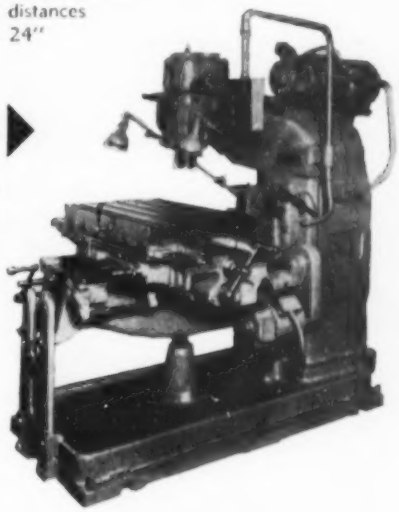
for Greater Machine Tool Production!

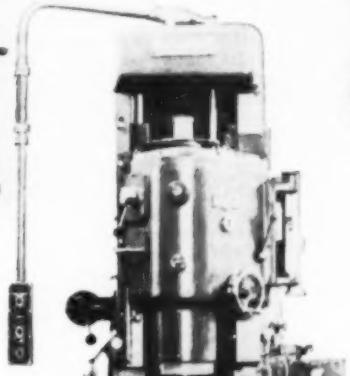


Engine and Tool Room Lathes Reed-Prentice Sliding Gear Head Lathes are available in 14", 16" and 20" Engine models and in 14" and 16" Toolroom models. Rugged construction preserves alignment and assures accuracy. Center distances from 30" up in 24" increments.



22V Vertical Millers 22VS

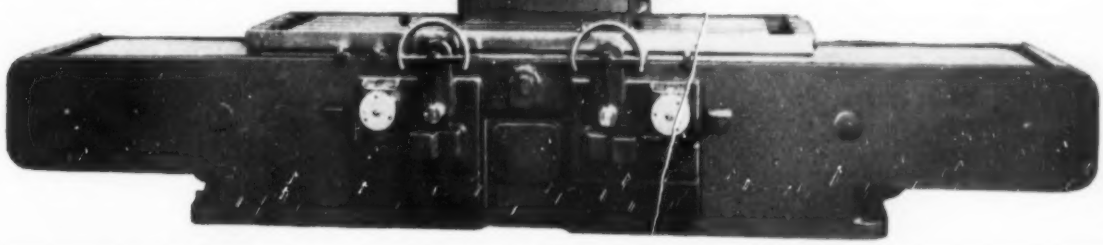
Reed-Prentice 22V and 22VS Millers that have 32 x 22" tables and 30" throat depth are unsurpassed for toolroom, die shop and general milling.



Large Range No. 4

Reed-Prentice No. 4 Vertical Miller is available in two models, providing either 60" or 96" longitudinal travel of table and table working surface of 24 x 96" or 132".

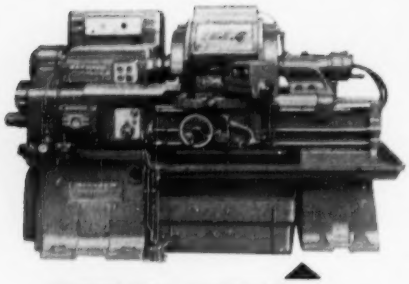
Heavy-duty No. 4 Miller features infinitely variable feeds for table, cross slide and vertical slide through electronic controls. One-two-and three-dimension General Electric contour follower systems available.



Machine Tool Representatives:

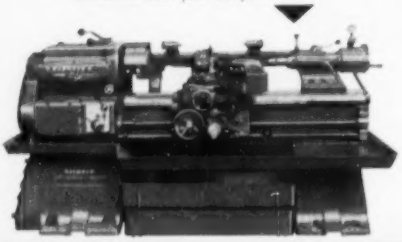
Philadelphia — Calco Machinery Co.
Buffalo — J. L. Osgood Machinery Corp.
Detroit — DoAll Detroit Co.
Grand Rapids — DoAll Grand Rapids Co.
Chicago — DoAll Mid-West Co.
Milwaukee — DoAll Wisconsin Co.
Minneapolis — Chas. W. Stone Co.
Houston — Preston Machine Tool Sales Co.
San Francisco — Montague-Harris Co.
Los Angeles — King Machinery Co.

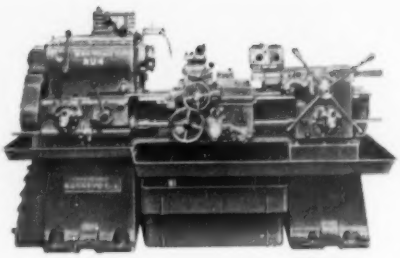
The entire line of Maxnovo machines is manufactured by one of Europe's most advanced manufacturers in this line. These machines can be furnished with many types of special attachments and tools too numerous to describe here.



MAXNOVO MODEL A AUTOMATIC CYCLE "PROFILMATIC" DUPLICATING LATHE. 17" swing over ways, 4½" over cross slide with 20", 30" or 40" center distance. This machine is equipped with air chuck and air tailstock to provide a completely automatic cycle with 2 or 3 automatic spindle speed changes and 6 or 12 automatic feed changes. Automatic speed and feed changes are accomplished by an automatic cycle control bar which is pre-set to operate precision microswitches at any point of the operating cycle. Copies from master template mounted at rear of machine out of the way of chips and coolant. 12½ or 15 H.P. drive. This machine can be furnished with complete tooling to produce parts in accordance with your blueprint.

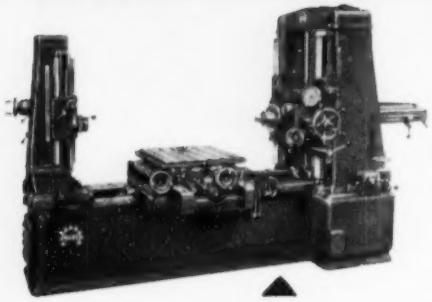
MAXNOVO MODEL U UNIVERSAL "PROFILMATIC" DUPLICATING LATHE. Swing over ways 17". Maximum turning dia. over cross slide 4". Distance between centers 30", 40", or 50". 6 or 12 spindle speeds from 75-1400 R.P.M. This machine duplicates automatically from either a sample work piece or from a flat template. The sensitive electro hydraulic tracing unit duplicates within extremely close tolerances. The duplicating slide can be locked out to permit use of the machine as a conventional lathe. 8 or 12 H.P. motor drive. This machine can be furnished complete with tooling to machine parts in accordance with your blueprints.





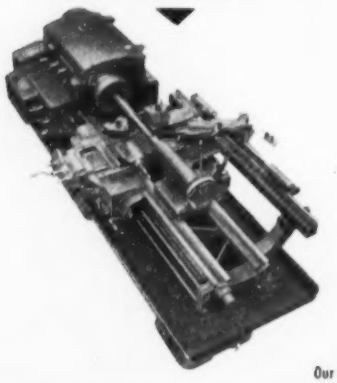
MAXNOVO MODEL RU 4 UNIVERSAL TURRET LATHE. Swing over bed 16-9/16". Swing over cross slide 9⅜" Capacity through spindle 2". Maximum distance spindle nose to face of turret 29½". Spindle speeds 64-1200 R.P.M. 8 power feeds to carriage .002"-.024" per rev. and 32 power feeds to turret .0005"-.048". 8 or 12 H.P. motor drive. Machine can be furnished with air chuck, collet chuck, or bar feed attachment. The hexagon turret faces are machined and tapped to American standards and will accept standard turret tools of leading American manufacturers of this type of machine.

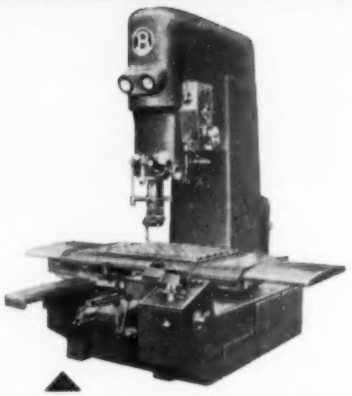
SEE THESE MACHINES



DIXI 60 COMBINATION HORIZONTAL BORING MILL AND JIG BORER WITH OPTICAL MICROSCOPES. Headstock, column, table settings accomplished by optical microscopes to insure overall accuracy of .0002". Built in rotary table also equipped with optical microscope for accurate angular settings. Table size 28¾" x 32⅛". Maximum distance table to spindle 19.7". Table travel longitudinal and traverse – 23⅝". Hydraulic feeds for all functions 0- 78" per min. #40 mm Taper spindle. Spindle travel 24.4". Spindle speeds 32-1350 R.P.M. Spindle feeds .0015"-.010" per rev.

SCHAERER MODEL UN-450 HEAVY DUTY COPYING LATHES. Twin cross slides. Copies from cylindrical or flat template either longitudinally or cross. Twin slides permits rough turning and finish turning in the same operation in many instances. Swings 17¾" over bed, 9" over carriage, 20-5/64" over gap. Center distance 60". Spindle speeds 31.5 to 1400 R.P.M. Hydraulic copying attachment can be removed to permit use as a regular twin slide lathe when necessary. 10 H.P. motor drive to spindle. Separate motors for coolant and hydraulic pick up. A production lathe built to tool room standards.





HY-OP 51 CO-ORDINATE UNIVERSAL MACHINE FOR JIG BORING, MILLING AND HOLE GRINDING. Completely hydraulic operation permits infinitely variable speeds and feeds. Optically controlled table adjustment permits settings to .00025". Table size 24¾" x 40", 28" center of spindle to column, 25-9/16" table to spindle face. Spindle speeds 100 to 1500 R.P.M. Feeds, infinitely variable 0-9-13/16" per min. Rapid traverse to table. 6 H.P. motor drive.

Our headquarters in New York City

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M. B. I. EXPORT & IMPORT LTD.

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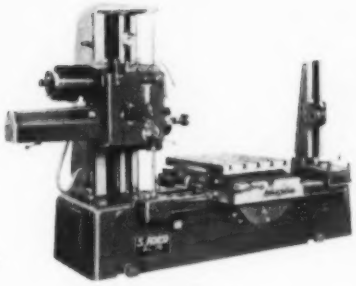
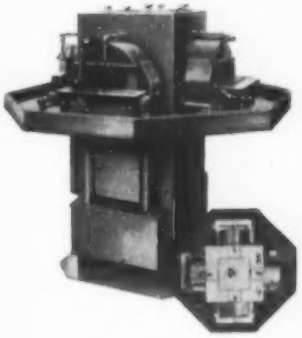


ROCCO TYPE AL-76 3" SPINDLE HORIZONTAL BORING MILL. #5MT spindle. Rotary table 39" x 29". Table travel: Longitudinal 40¾, 53"-without column, Cross 30". Maximum distance spindle to table: 31½". 24" spindle traverse. 16 spindle speeds 13-850 R. P. M. 18 feeds .0006"-.157". 8 H.P. drive.

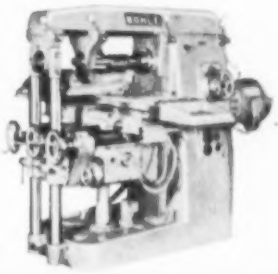
PRAEHOMA TYPE LW600 PRECISION HYDRAULIC SURFACE GRINDER. 26" x 8" table, 16½" spindle center to table. 8" diameter grinding wheel. Longitudinal table speed infinitely variable 0-50 ft. per min. Automatic cross feed with rapid traverse. Separate motors for spindle, hydraulic system, and coolant system. Magnetic chuck with rectifier available.

QUART CARBIDE TOOL GRINDER. 4 working positions. Three 12" silicon carbide cup wheels and one 14" straight wheel. Individual direct motor drive and separate control switch for each working position. Wheel speed 1750 R. P. M. Provision for diamond dressing tool at each working position. MODEL TRIAX (not shown) same as above, but with 3 cup wheels and 3 working positions only.



BOHLE MODEL FW-6 HORIZONTAL MILLING MACHINE. Table size 14.2" x 64". Longitudinal table travel 48". 18 feeds 9/32"-28" per min. Power rapid traverse in all directions. 18 spindle speeds 28-1400 R. P. M. #50 mm Taper. 15 H.P. spindle motor. Separate 2 H.P. feed motor.

Model FS-6 Vertical Machine (not shown) same as above, but with 20 H.P. spindle motor.



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at Booth 706 Western Metals Exhibition March 23-27

Modern machine tools, built by reputable, old established European machine tool builders to the highest standards of **quality, accuracy, rigidity and performance.** Distributed exclusively in the United States by M.B.I. for over 25 years manufacturers of precision products.

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- *Your Operators Trained*
- *Competitive Prices*
- *Financing & Rental Plans to Meet Your Requirements*
- *Engineering Staff will make recommendations based on your drawings*

MBI

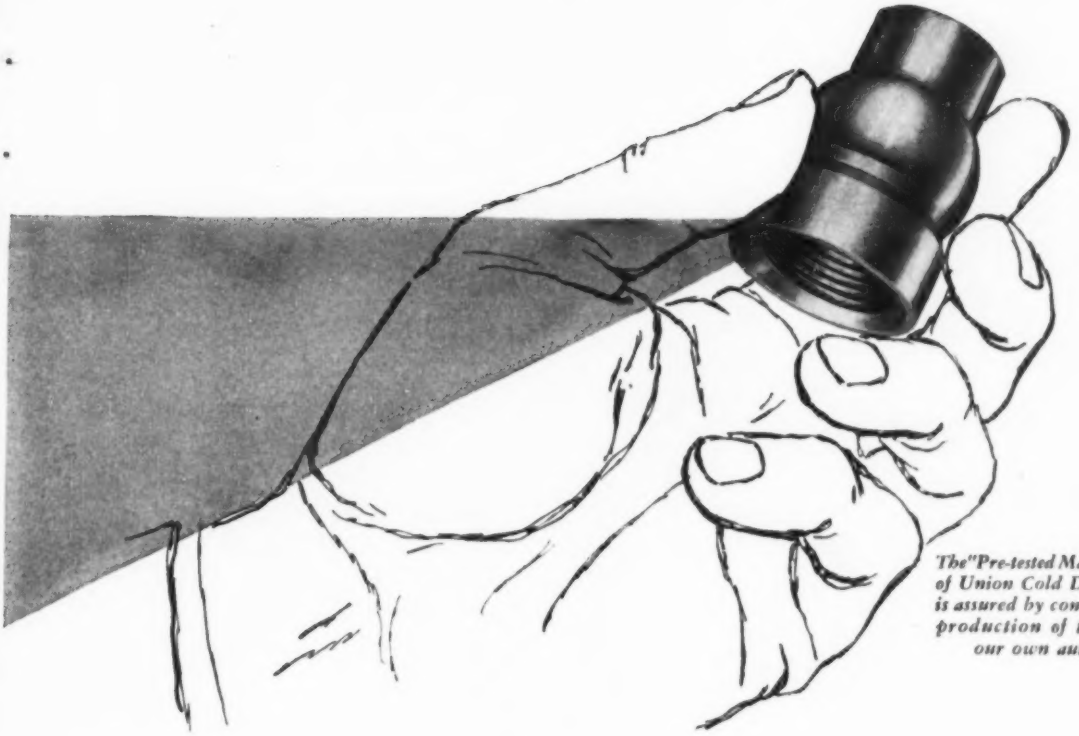
Here, in the tool zone, is where the superior machinability of Union Drawn Steels pays profits.

PRE-TESTED MACHINABILITY TO HELP YOU MAINTAIN PRODUCTION...AND PROFITS!

6 HELPFUL MANUALS

filled with how-to-do-it information and data to help you use Republic Union Cold Drawn Steels. Write for "Union Drawn Pocket Library."

REPUBLIC STEEL



The "Pre-tested Machinability" of Union Cold Drawn Steels is assured by continuous test-production of this part on our own automatic.

Your set-up men and automatics can get into production sooner, with fewer headaches, because our automatic screw machine shop at Massillon, Ohio, is the world's largest producer of a completely useless part . . . shown above.

Day-after-day, a modern automatic turns out only this part. It embodies the 6 most common "automatic" operations . . . it tells us how our Republic Union Cold Drawn Steels will behave in *your* shop, on *your* machines. It also tells us how to make Union Drawn Steels even better for automatics . . . even *more* free-machining . . . even *more* profitable for you.

In *your* shop, our Republic Field Metallurgists can help you use the things we have learned in *our* shop . . . better set-ups, heavier feeds and faster speeds, most efficient tool angles . . . all the knowledge to help you make the most of Union Drawn *machinability* on your job schedule and your profit sheet.

When may we call?

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

Republic UNION® COLD DRAWN STEELS

Free-Machining Bessemer, Alloy and Enduro Stainless Steels
•
Union Cold Drawn Special Sections
•
Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting.)

SIZE IDENTIFIED ASSEMBLY SIMPLIFIED

The Only

SIZE-MARKED GEAR GRIP SOCKET HEAD CAP SCREW

The size is clearly incised on the head, can be seen at a glance. It prevents errors by "green" workers, helps veterans also to speed assembly. It saves time and wasted screws when sizes get mixed up.

It's a sales feature for your product. Your customers' maintenance men will like the Size-mark . . . it aids them in reassembling after servicing. Gear Grip prevents slips, speeds work, even when fingers are oily.

Since there is no better Socket Head Cap Screw made, why not get these important extra features offered only by P-K? Ask for samples. Parker-Kalon Corp., 200 Varick St., New York 14, N.Y.

FOR ANY TYPE SOCKET SCREW—
REMEMBER

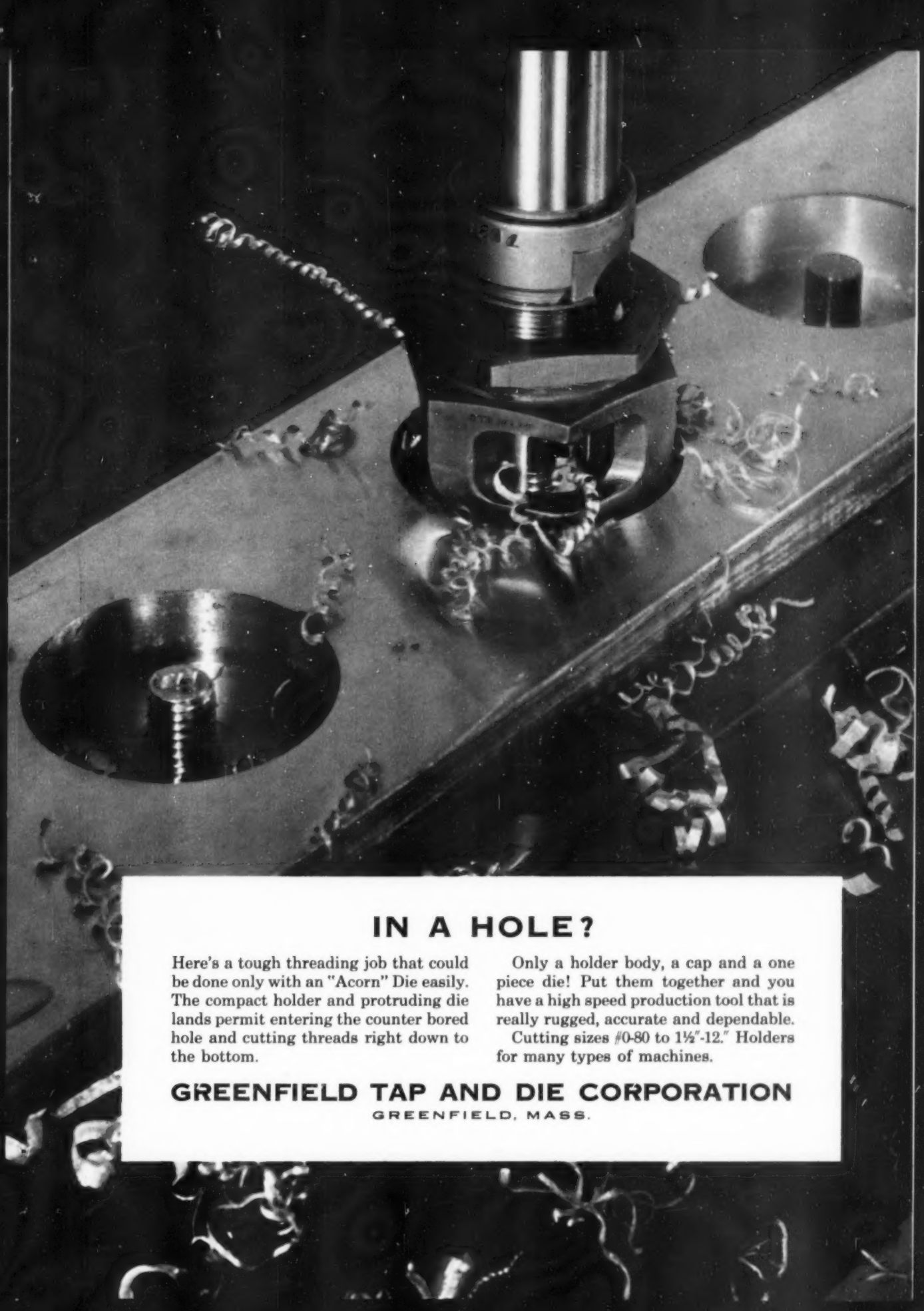
IF IT'S **P-K** IT'S O.K.
TRADE MARK REG. U.S. PAT. OFF.

PARKER-KALON®

Sold through Industrial Distributors, the Supply Specialists that serve you

Cold-forged **SOCKET SCREWS**

CAP FLAT HEAD BUTTON HEAD SHOULDER SET HEX KEYS



IN A HOLE?

Here's a tough threading job that could be done only with an "Acorn" Die easily. The compact holder and protruding die lands permit entering the counter bored hole and cutting threads right down to the bottom.

Only a holder body, a cap and a one piece die! Put them together and you have a high speed production tool that is really rugged, accurate and dependable.

Cutting sizes #0-80 to 1½"-12." Holders for many types of machines.

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASS.

IT'S SOLID . . ADJUSTABLE . . COMPACT!

Whenever you need an adjusting tap, but can't use a collapsing tap . . . especially where tooling space is limited and fast withdrawal not necessary . . . you'll find the GEOMETRIC Class SJ Solid Adjustable Tap ideal. This short, stubby tap will give you the advantages of fast adjustment to required decimal sizes or different class of thread and may be used for more than one pitch by the use of interchangeable chasers!

Class SJ taps available in eleven sizes covering the cutting range $1\frac{5}{16}$" through $8\frac{1}{2}$".

Write for full details. Specify Bulletin SJ

Greenfield Tap and Die Corporation

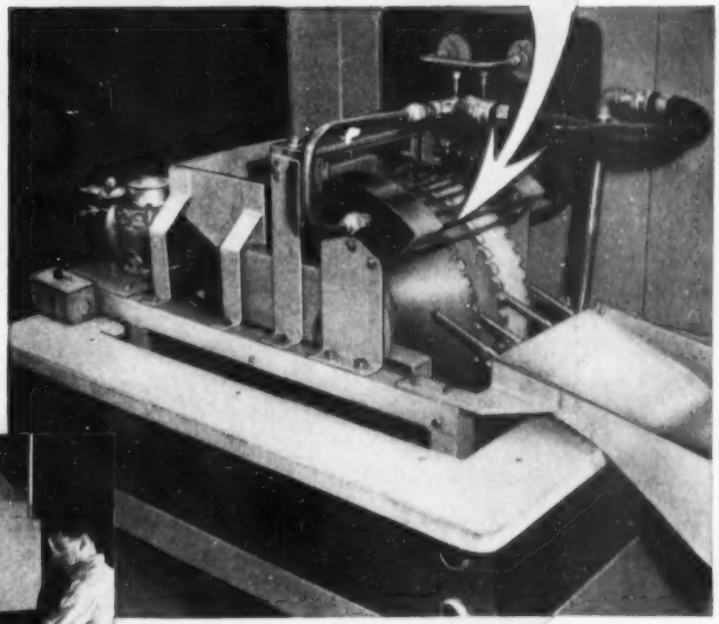
GEOMETRIC TOOL COMPANY DIVISION

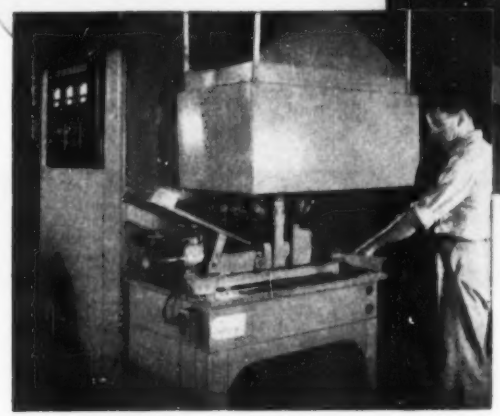
NEW HAVEN 15, CONNECTICUT

Fast!

ALLIS-CHALMERS Induction Heating

Hardens 3600 *Lifter Rods Per Hour*





Get high production like this with Allis-Chalmers induction heaters. In this application push rods are picked up from a hopper by a rotating wheel, conveyed through the coil, heated at both ends simultaneously, then oil spray quenched and deposited in a bin.

This same heater can be used for brazing, soldering, annealing, as well as case and through hardening. A simple switch from one work coil to another is all that's needed. Remember this! When coils are changed, there's no need for additional output transformers (needed on most units) which require special shielding and skilled help to install.

Cost of owning and operating an Allis-Chalmers induction heater is surprisingly low, too. Here's the cost per hour, not including labor:

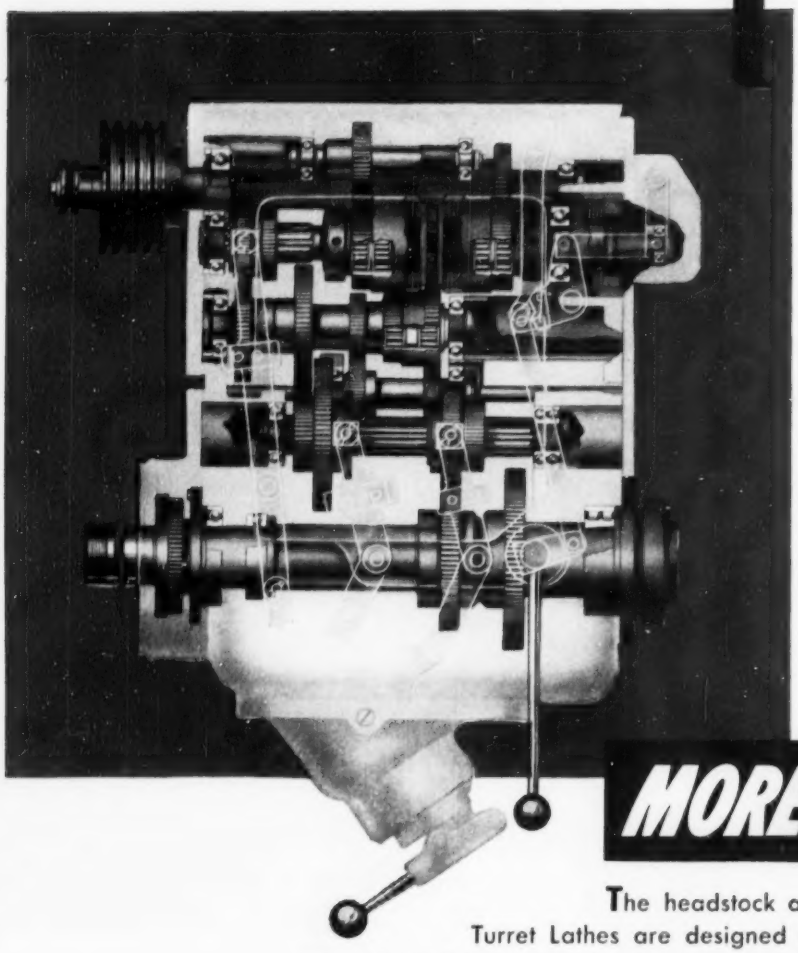
	10 kw unit	20 kw unit
Tube replacement (5,000 hrs)	0.070	0.110
Fixed energy	.020	.034
Load energy 85% duty cycle at .01 per kwh	.170	.340
Water	.010	.032
Amortization 20,000 hrs	.244	.354
Total cost per hr.	**$0.514**	**$0.870**

High production, plus versatility, plus low operating cost make these Allis-Chalmers induction heaters important time and money savers. Find out what they can do for you. Call your nearby Allis-Chalmers district office or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3961

ALLIS-CHALMERS

another reason why J&L turret lathes produce

MORE CHIPS PER TOOL
MORE PIECES PER HOUR
MORE PROFIT PER JOB



MORE POWER TRANSMISSION!

The headstock and transmission of all J & L Turret Lathes are designed and built for silent, smooth power transmission under the most exacting conditions. Anti-friction bearings are used throughout. The front spindle bearing is preloaded to take much heavier loads than will be encountered in actual service. Heavy cuts can be taken at high or low spindle speeds — or light, accurate finishing cuts can be taken at high spindle speeds, without readjustment. All gears are alloy steel, precision finished.

P.S. *You get all the horsepower you need when you want it. Write to Dept. 710 for Catalog.*

"World's most accurate and powerful turret lathes"

RAM TYPES: Bar, 1½" to 4½", Chuck, 10" to 12". SADDLE TYPES: Bar, 2½" to 5", Chuck, 12" to 18".

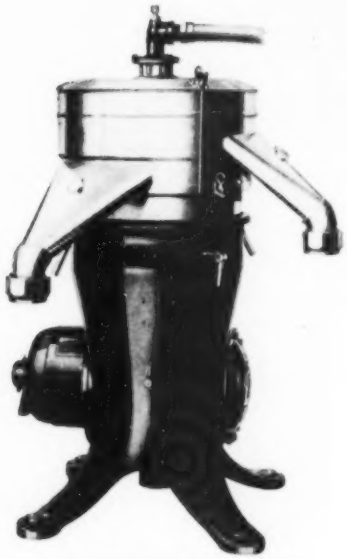
JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L TURRET LATHE DIV.

NO GETTING AROUND IT!

CENTRIFUGED WASH OIL IS A SOURCE OF PROFIT!



Purifying the oil used to wash parts—such as ball bearings—can be a very profitable operation. When the surfaces of the bearings are sprayed with jets of oil, the oil picks up particles that would soon contaminate it if they were not removed. De Laval machines restore this oil to full usefulness instantly, by throwing out all such undesirable solids.

Most metalworking plants present several opportunities to use De Laval centrifugal machines to advantage. Cutting oil . . . lubricating oils . . . shock absorber oils . . . test oils . . . are just a few typical applications in which oil purifiers can be used to get rid of ***solid*** contaminants. Hydraulic oils . . . vacuum pump seal oil . . . can be continuously ***dehydrated*** by the same means. All such applications have one thing in common — the De Laval centrifuge does a complete job of restoring the oil.

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6

DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL PURIFIERS AND CLARIFIERS FOR FACTORY OILS

for production
or tooling
drilling
reaming
or tapping

Get all these features

CENTRALIZED CONTROLS

Every control in reach, easy to operate . . . saving operator effort and production time.

VARIETY OF SPEEDS AND FEEDS

A better job faster because the right combination is easily selected.

AUTOMATIC LUBRICATION

Built-in accuracy maintained and protected for years on end by positive lubrication.

GREATER RUGGEDNESS

Every part engineered for maximum strength and balance, assuring long, useful life.

MORE AUTOMATIC STOPS

Save time and reduce manual operations to an absolute minimum.

You'll find MORRIS Mor-Speed RADIAL DRILLS' accuracy and low cost production an important advantage in the fight against rising prices. Write for your copy of the latest Radial Drill Catalog today.

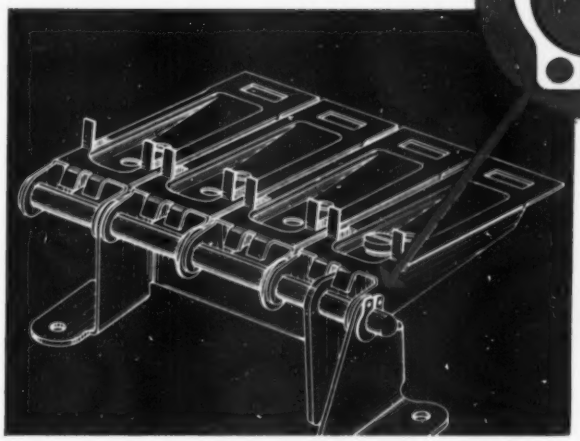
a better product at less cost —with precision PLUS *production*

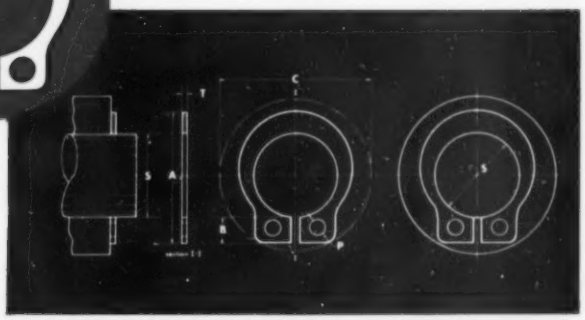
Bellows MOR-SPEED Line

Morris

THE MORRIS MACHINE TOOL COMPANY, 933 HARRIET ST., CINCINNATI 3, OHIO

New Waldes Truarc GRIP Ring requires no groove, holds fast by friction, can be used over and over again





Ring # 5555		5555-12	5555-13½	5555-18	5555-25	5555-31	5555-37
SHAFT DIAMETER	Fract. Equiv. S	1/8"	—	3/16"	1/4"	5/16"	3/8"
	Dec. Equiv. S	.125	.136	.187	.250	.312	.375
	TOL.	±.002	±.002	±.002	±.002	±.003	±.003
RING DIMENSIONS	Thickness T	.025	.025	.035	.035	.042	.042
	TOL.	±.0015	±.0015	±.002	±.002	±.002	±.002
	Length A	.268	.285	.364	.437	.553	.626
	Lug B	.078	.078	.097	.097	.141	.141
	Hole P	.042	.042	.042	.042	.078	.078
	Min. Ring Clear C	.33	.34	.44	.50	.67	.73
Approx. Ultim. Thrust Load (Lbs)		20	20	25	35	50	60

The Waldes Truarc Grip Ring is a new, low cost fastener that provides a positioning shoulder secure against moderate thrusts or vibration. Installed on a straight ungrooved shaft, the Truarc Grip Ring can be assembled and disassembled in either direction with Truarc pliers.

The Grip Ring can be installed tightly against a machine part in order to take up end-play. The basic Truarc design principle assuring complete circularity around periphery of the shaft and the ring's unusually large radial width combine to exert considerable frictional hold against axial displacement. The ring can be used again and again.

Find out what Waldes Truarc Retaining Rings can do for you. Send us your drawings. Waldes Truarc engineers will give your problems individual attention without obligation.

SEND FOR NEW CATALOG

WALDES

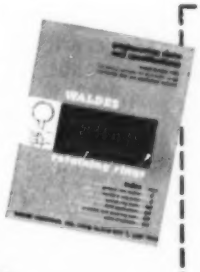
TRUARC

REG. U.S. PAT. OFF.

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,302,947; 2,302,948; 2,410,052; 2,420,921; 2,420,341; 2,439,785; 2,441,845; 2,455,165; 2,483,380; 2,483,393; 2,487,802; 2,487,803; 2,491,306; 2,500,091 AND OTHER PATENTS PENDING.



Waldes Kohinoor, Inc., AM-035
47-16 Austel Place, L.I.C. 1, N. Y.

☐ Please send me sample Grip-Rings (please specify shaft size _____)

☐ Please send me the complete Waldes Truarc catalog.

(PLEASE PRINT)

Name _____

Title _____

Company _____

Business Address _____

City _____ Zone ____ State _____

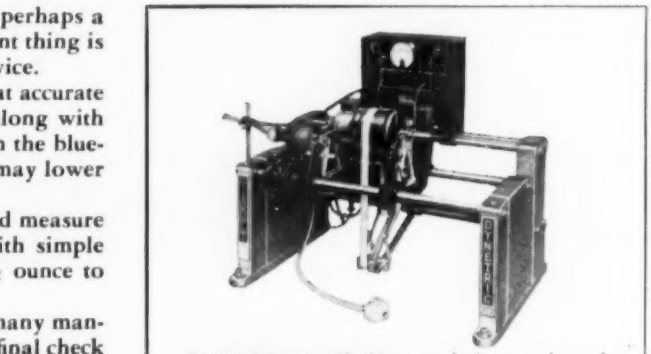
the final *check* for every rotating part . . .

Maybe it's a crankshaft or an armature . . . perhaps a fan or a belt pulley. No matter. The important thing is this: If it isn't *balanced,* it isn't ready for service.

Smooth operation and long life require that accurate static and dynamic balance be rated right along with mechanical specifications . . . incorporated in the blueprints. Then, no vibration, however slight, may lower the efficiency of the finished product.

Gisholt Balancing Machines can locate and measure unbalance vibrations down to .000025" with simple readings . . . handle any assembly from ½ ounce to 50 tons.

The cost? Very moderate. That's why so many manufacturers insist that their products have the final check which only Gisholt Balancing Machines can provide.



Gisholt Balancing Machines, made in a variety of sizes and types, can also be furnished with correction equipment designed to meet your specific requirements.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

DYNETRIC BALANCERS — GISHOLT — DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION "DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Operators Know It's Their Good Fortune . . .

No wonder metal cutting operators say every day is a lucky day for them when CIMCOOL° is on the job. For this radically new and different coolant *makes jobs better . . . and does a better job!*

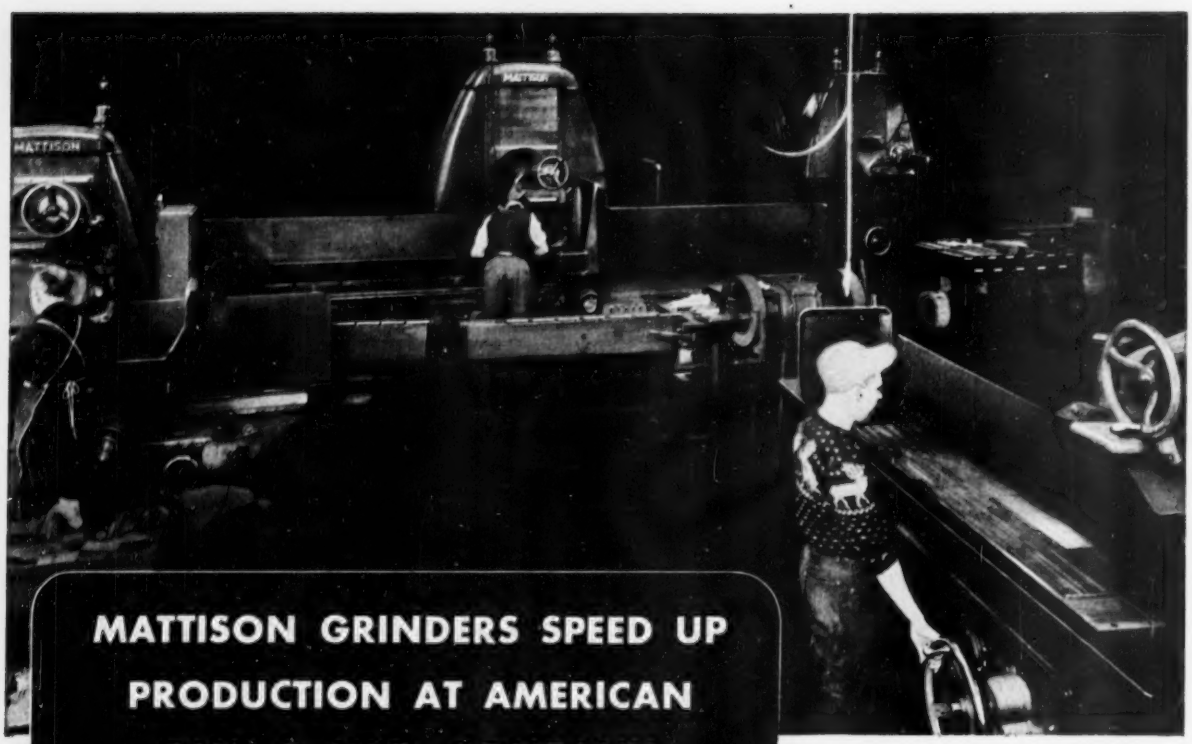
It's crystal-clear why operators call Cimcool the biggest working improvement in years. This revolutionary cutting fluid—this *chemical emulsion*—virtually eliminates rancidity and foul odors—even in the hottest weather! Can't burn. Can't smoke. Has no objectionable odor of its own. Doesn't soil hands or clothes and contains no skin irritants. Leaves no hazardous slippery film on the hands, machine, work or floor. And Cimcool cools so fast that tools and chips actually stay cool to the touch.

We predict that one week's run will convince you that Cimcool is far superior to old-fashioned coolants. For a demonstration in one of your own machines, just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet "Cimcool Defeats Heat." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

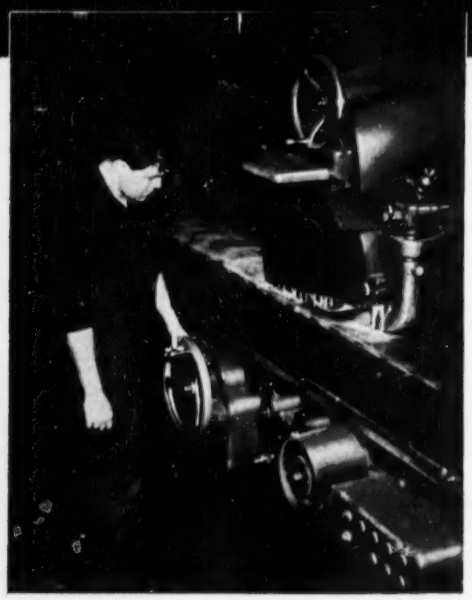
°Trade Mark Reg. U.S. Pat. Off.

A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

for 85% OF ALL METAL CUTTING JOBS



MATTISON GRINDERS SPEED UP PRODUCTION AT AMERICAN SAW & MFG. COMPANY

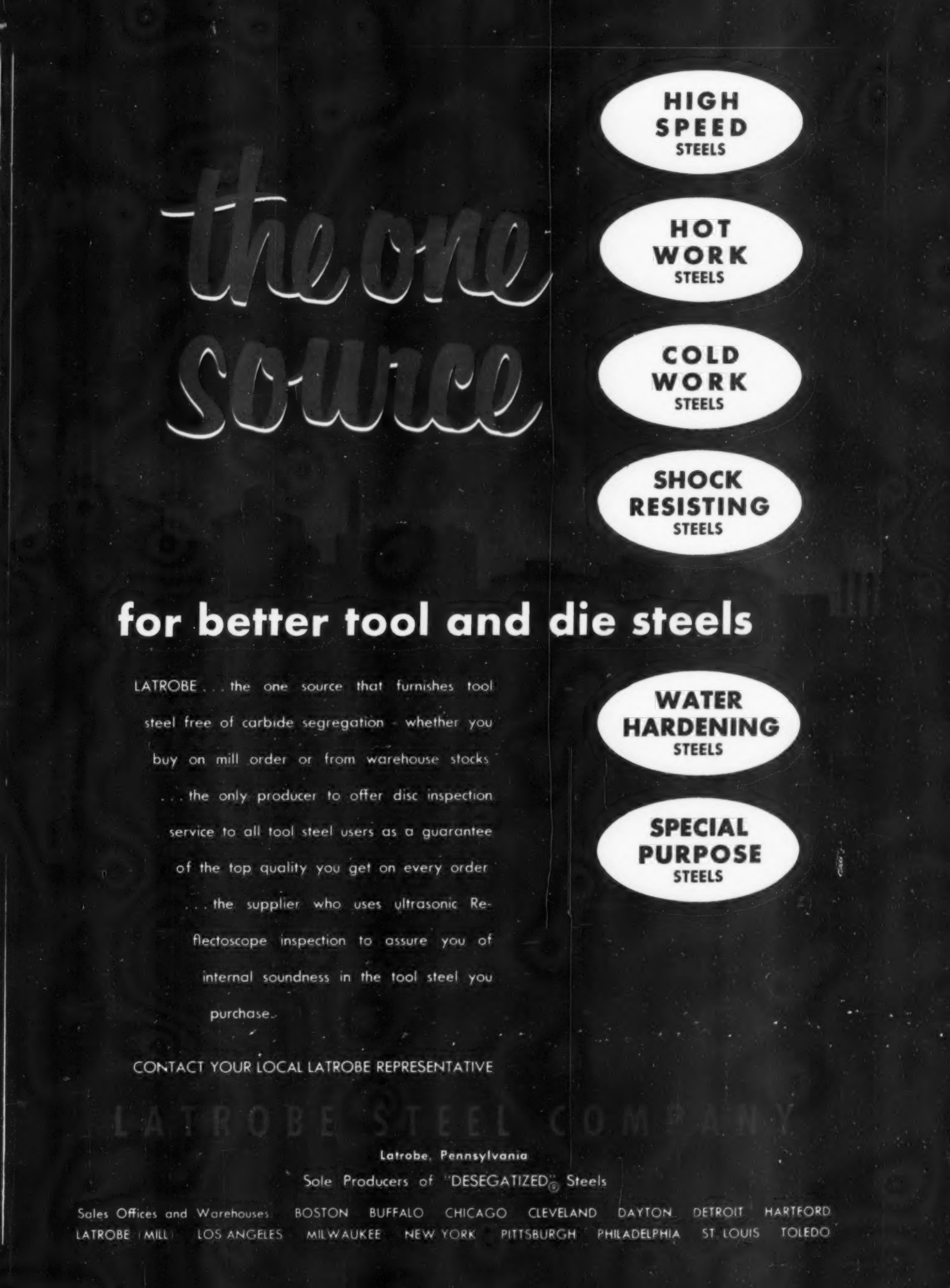


● The four Mattison High Powered Precision Surface Grinders shown above are used by American Saw & Mfg. Company for the grinding of annealed tool steel strips and bars on a real production basis in the manufacture of Lenox Precision-Master Ground Flat Stock. Exacting manufacturing specifications demand excellent finishes within close limits of accuracy.

The massive double column support, high power and rigidity of construction of the Mattison Grinder combine with accuracy and speed of operation to insure consistent precision results on a high production basis for American Saw & Mfg. Company. For complete information regarding the capabilities of the Mattison High Powered Precision Surface Grinder send for free circular.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS



for better tool and die steels

LATROBE . . . the one source that furnishes tool steel free of carbide segregation - whether you buy on mill order or from warehouse stocks . . . the only producer to offer disc inspection service to all tool steel users as a guarantee of the top quality you get on every order . . . the supplier who uses ultrasonic Reflectoscope inspection to assure you of internal soundness in the tool steel you purchase.

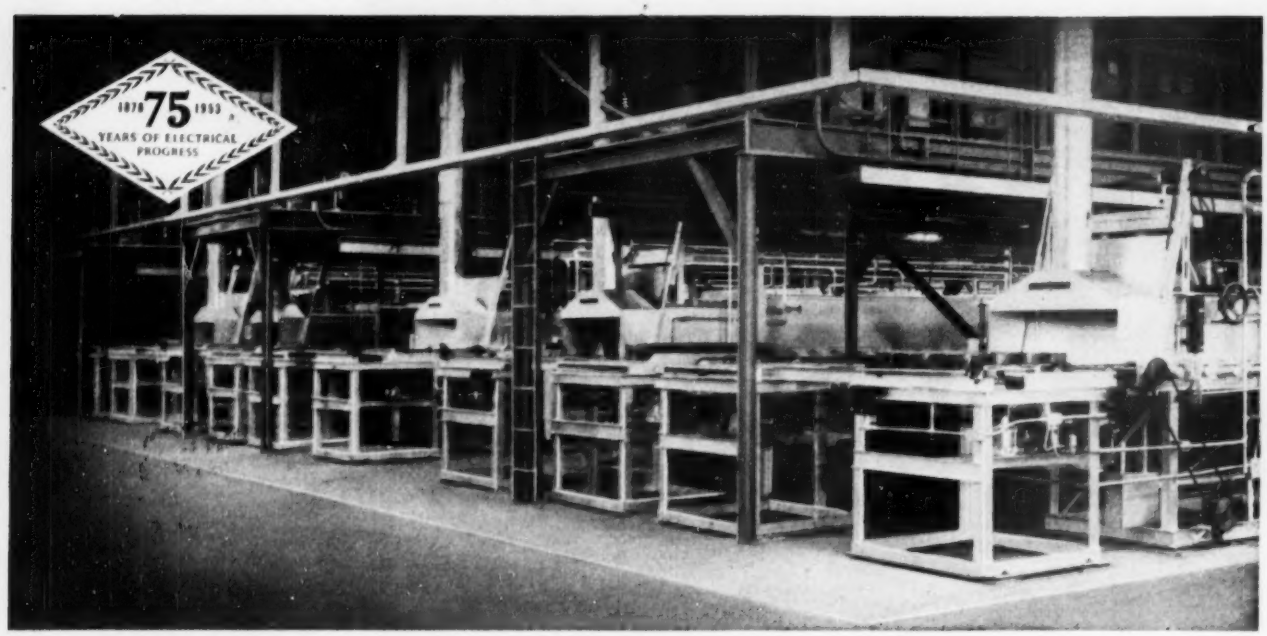
CONTACT YOUR LOCAL LATROBE REPRESENTATIVE

LATROBE STEEL COMPANY

Latrobe, Pennsylvania

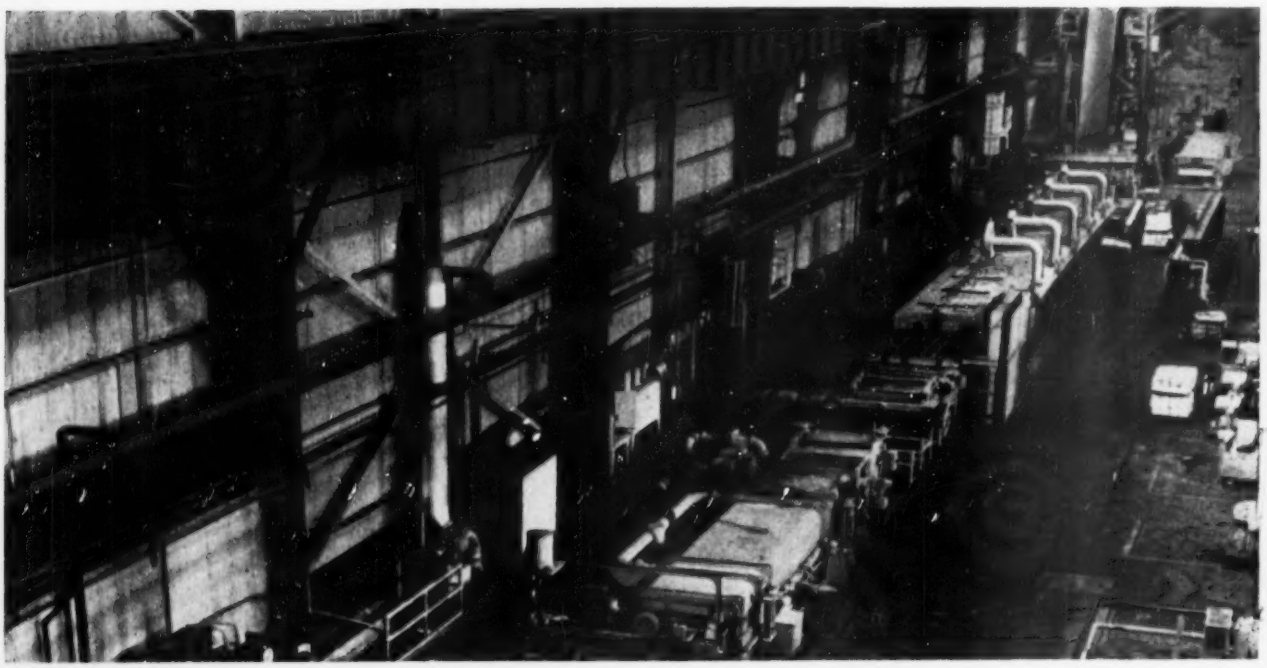
Sole Producers of "DESEGATIZED"® Steels

Sales Offices and Warehouses BOSTON BUFFALO CHICAGO CLEVELAND DAYTON DETROIT HARTFORD LATROBE (MILL) LOS ANGELES MILWAUKEE NEW YORK PITTSBURGH PHILADELPHIA ST. LOUIS TOLEDO

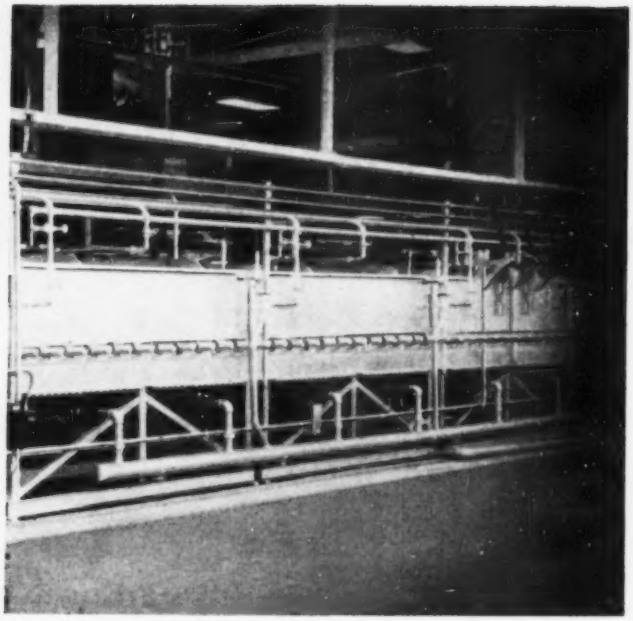


THE EXACT EQUIPMENT to fill your requirements can usually be built from existing G-E designs. Like these five standard roller-hearth annealing furnaces, your equipment can be shipped quicker and will cost you less. G-E Heating Specialists, located in major cities throughout the country, have wide knowledge of your heating

Why You Should Ask For a G-E Bid



CORRECT INSTALLATION is an accepted fact when you specify G-E equipment and supervision. This electric furnace and induction preheat section were designed to meet customer's exact requirements for continuous annealing and galvanizing of steel strip. Experienced installation men supervised the complete set-up.



processes and can assist you in selecting the proper furnace or induction heater. Let him help you to solve *your* problem, as he did for this plant . . .

THE PROBLEM: To sinter carbides at 3000F, in a neutral atmosphere, with temperature variation of ±0.1%. *Standard* G-E equipment fit each requirement.

On Furnaces and Induction Heaters

FAST SERVICE WORK? During World War II, six huge elevator furnaces annealed aluminum at a southern plant. When their Chicago plant opened, the Chicago G-E Service Shop quickly dismantled and transported these furnaces to the new plant, then rebuilt and erected them as bell-type furnaces. The shop nearest you is just as willing to do the large or small repairs you may need—and their phone is answered at any hour.

THE RESEARCH DISCOVERIES and engineering advances in heat-treating made by G-E laboratories are passed on to you as better equipment, and as invaluable process information. From General Electric has come such developments as furnace brazing, the first resistance-electric furnace, stepless temperature control for electric furnaces, the first protective gas-atmosphere producer plus pioneering work on electronic induction heating. We shall continue to earn your respect and business by providing the highest quality equipment and the most advanced designs to fit your exact needs.

WHEN YOU DEAL WITH G-E on heating equipment, here is what you receive: (1) proper equipment from hundreds of existing designs—or we will build special equipment to suit your needs (2) correct installation supervised by experienced men (3) experienced application men to help solve your heating process problems (4) fast repair work from nearby G-E Service Shops (5) plus development leadership on products and processes. Consider G-E equipment for these heating processes: brazing, sintering, porcelain-enameling, wire-enameling, general heat-treating, and annealing malleable iron.

ASK FOR THE SERVICES of a G-E Heating Specialist when you have heating problems or are considering new heating equipment—call the nearby G-E Sales Office, or write General Electric Company, Schenectady 5, N. Y. Consider well his proposal for it is no idle boast when we say of G-E furnaces and induction heaters . . . 720-100

You can put your confidence in—

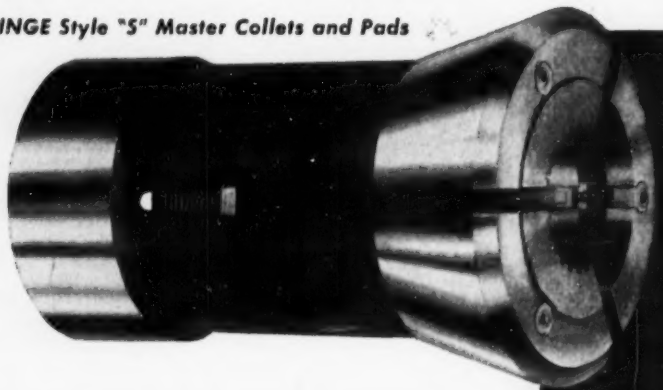
GENERAL ELECTRIC

HARDINGE
ELMIRA, N.Y.

MASTER COLLETS AND FEED FINGERS

For Progressive Screw Machine Plants

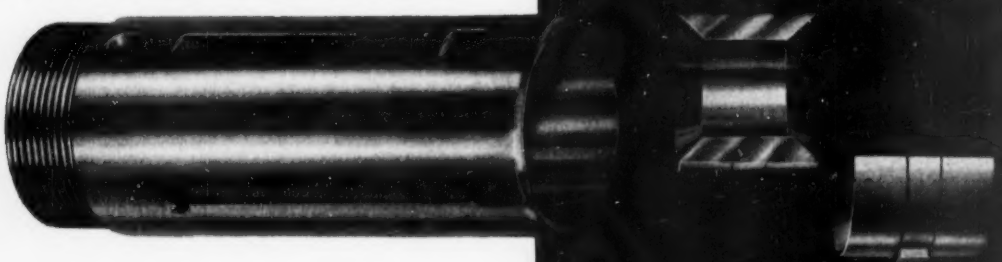
HARDINGE Style "S" Master Collets and Pads



The Only MASTER COLLET With No Work Pressure on the Screw.

Pads Cannot Work Loose
No Screws No Pins

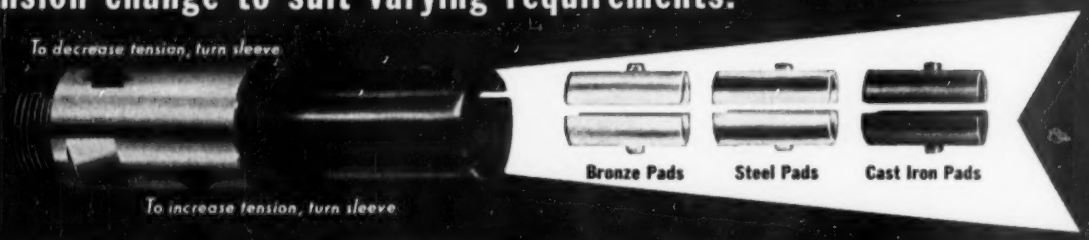
HARDINGE Style "B" Master Feed Fingers and Pads



Pads interchange with Masters for different makes of machines having the same capacity.

Write for descriptive Bulletins.

HARDINGE Master Feed Fingers with Adjustable Tension - provide tension change to suit varying requirements.



HARDINGE BROTHERS, INC., ELMIRA, N. Y.

Red Shield says:

"STANDARD for tough jobs since 1881"

as near as your telephone

Call your Industrial Supply Distributor for Shield Brand Twist Drills. Specialized factory service available everywhere.

STANDARD TOOL CO.

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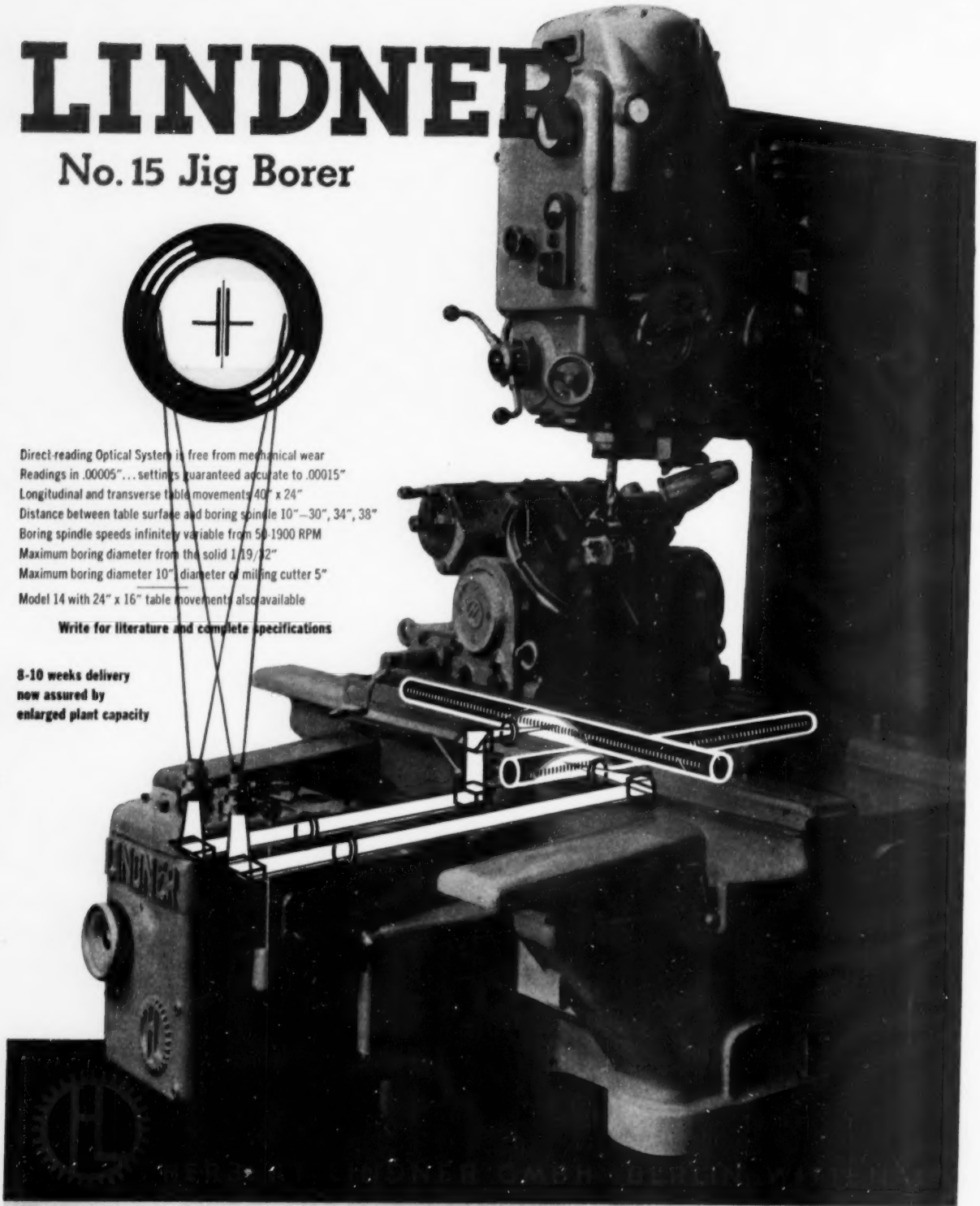
NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

LINDNER

No. 15 Jig Borer



Direct-reading Optical System is free from mechanical wear
Readings in .00005"... settings guaranteed accurate to .00015"
Longitudinal and transverse table movements 40" x 24"
Distance between table surface and boring spindle 10"—30", 34", 38"
Boring spindle speeds infinitely variable from 50-1900 RPM
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Maximum boring diameter 10" diameter of milling cutter 5"

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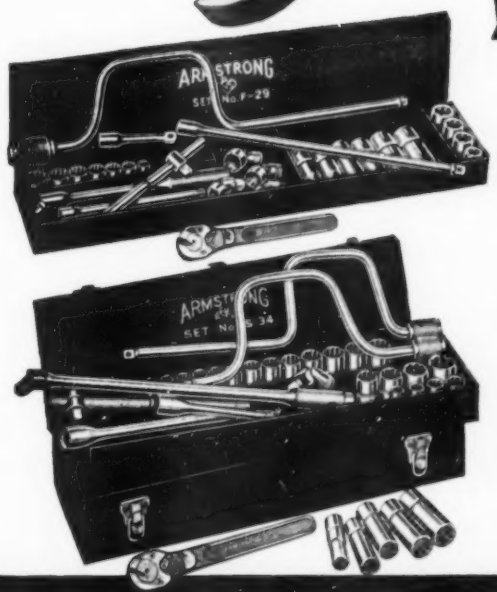
Choose Your Wrenches as you do your friends--for life

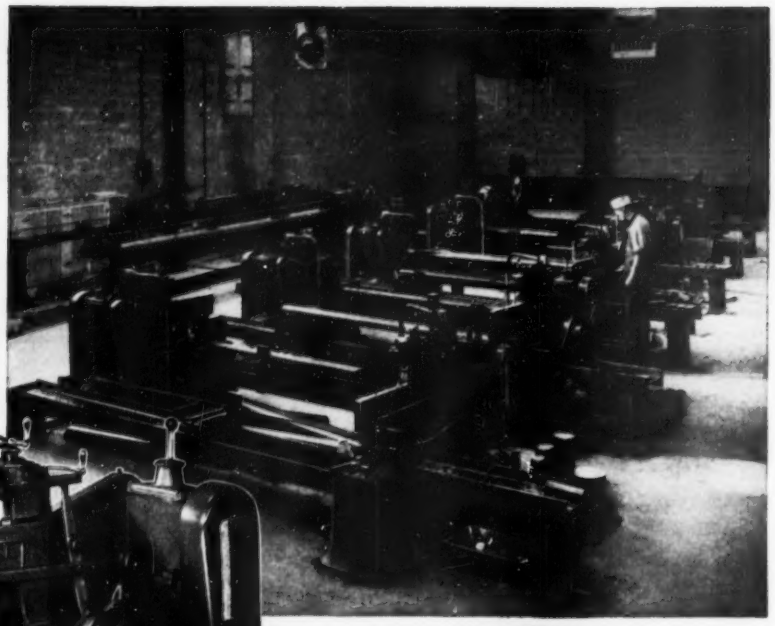
Specify ARMSTRONG Wrenches for lifetime service, for finely balanced tools that feel right in the hand and make work easier, faster and less fatiguing. ARMSTRONG Wrenches generally are longer for size—give greater leverage. Accurately milled or broached openings give the proper clearance. They are safe wrenches because they are strong beyond need.

Drop forged and machined from high tensile carbon or special alloy tool steels, ARMSTRONG Wrenches are heat treated, tempered and tested to an exact balance of toughness, hardness and tensile strength. Each is beautiful in finish and line, is a quality tool to be proudly possessed by any mechanic—or certain to "give a lift" to any assembly line. Buy wrenches which carry the trade marks HI-TEN or ARMALOY. On carbon or alloy steel wrenches these trade marks are your guarantee of lifetime quality.



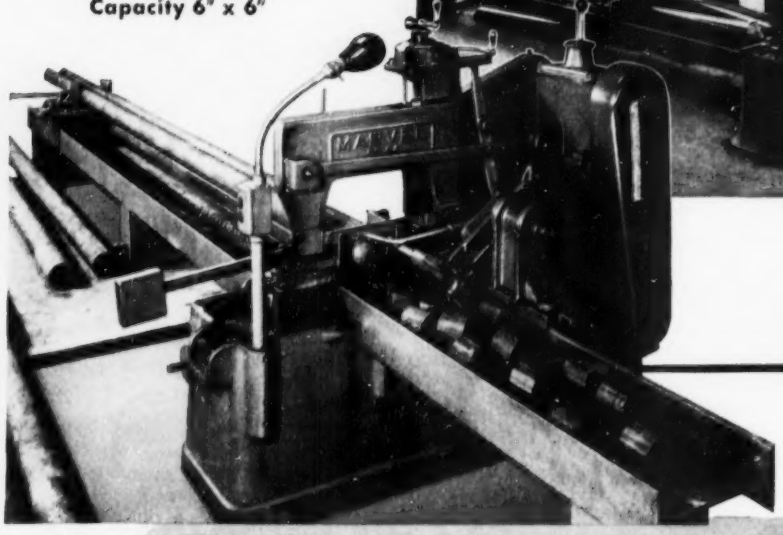
WRITE FOR CATALOG

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.



No. 9A MARVEL
Production Saws
Capacity 10" x 10"

No. 6A MARVEL
Production Saws
Capacity 6" x 6"



Eight of these MARVEL 9A Saws have already earned *Service Stripes**

Eight of these high speed MARVEL Production Sawing Machines at the Accuracy Steel Cutting Company, Hazel Park, Michigan, (a suburb of Detroit) operated almost continuously thruout the last war—cut up thousands of 20 ft. bars into accurate slices, pieces and lengths, for war production.

Now with a battery of fifteen of these world's fastest hack saws, Accuracy Steel Cutting Company has immense capacity to put behind defense and civilian work.

MARVEL Production Saws will automatically cut bar stock to size at terrific speed . . . they will feed, measure and accurately cut-off identical pieces from single or nested bars *automatically*, with no more operator attention than a battery of automatic screw machines.

Versatile, as well as accurate and fast, these saws can be stopped at any point in a production run—a miscellaneous cut made—and production resumed by simply re-engaging the automatic bar push up.

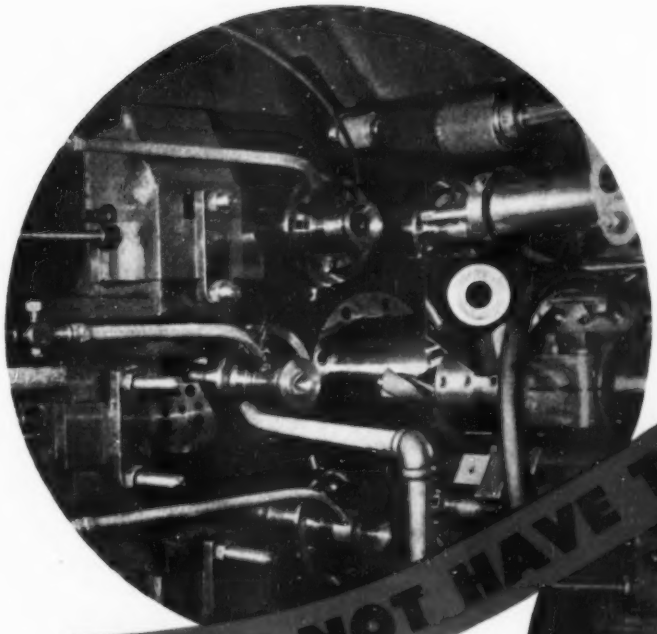
Write for Catalog

MARVEL *Metal Cutting* **SAWS**

Better Machines–Better Blades

ARMSTRONG-BLUM MANUFACTURING CO.

5700 Bloomingdale Avenue *"The Hack Saw People"* **Chicago 39, U. S. A.**



WHY NOT HAVE THE FIGURES?

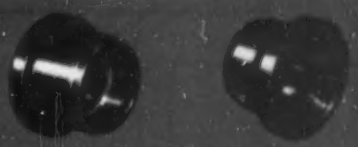
Front Side of Tooling Area
Rear Side of Tooling Area →

If you have a tough forming job in mind for a new "automatic," it's more satisfactory to know the recommended maximum load of the proposed machine's cross slides than to merely be told that they are *rugged.*

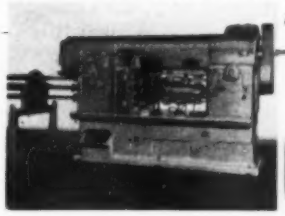
Before a machine can satisfy an important requirement it must be *built that way.* And built to figures instead of adjectives.

There are many factors involved in the building of any brand of Multiple Spindle Bar Automatic, factors on which you may want the figures. You may have the figures on CONOMATICS.

A Comparison of ALL Automatics is in Favor of Cone



In producing the alloy steel part shown, the maximum load recommendation for each main cross slide of the 3½-SIX is 8,000 foot pounds. The total net weight of the main cross slides is 825 pounds.



Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

You can save lots of time

with these BEHR-MANNING® Abrasive Tools

There are dozens of operations in most shops where these handy abrasive tools profitably replace clumsy and time-consuming methods. You can, of course, wrap a piece of abrasive cloth on a round object and polish a hole with it, but why not use a METALITE Cloth Pencil on a mandrel in a portable tool? It's a lot faster. Same for deburring or radiusing the edge of a hole—a METALITE Cloth Slotted Disc is a slick trick for that job.

All of these tools have been devised to cut out profit-leaks on operations that are common in many shops—perhaps in your own. Get in touch with your BEHR-MANNING Field Engineer who will be glad to help you.

The packet "Blueprints for Production" gives various case histories that show new ways in which BEHR-MANNING coated abrasives are cutting production costs. For your copy, write Behr-Manning Corp., Troy, N. Y., Dept. AM-3.

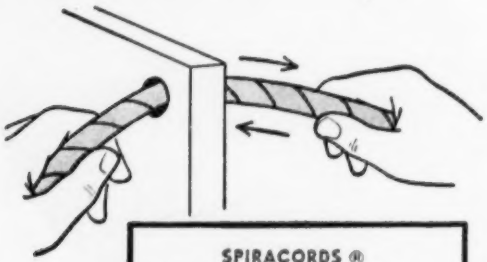
® * Trade-marks

METALITE CLOTH PENCILS

Used on a mandrel for polishing channels, fillets, rounded corners, and the sidewalls and bottom of "dead-end" holes.

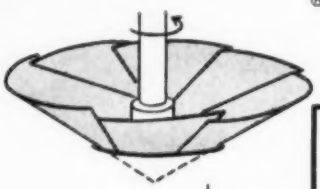
METALITE ® CLOTH SPIRAPOINTS ®

Mounted on threaded mandrels, they produce high finishes in odd-shaped recesses or on various radii.



SPIRACORDS ®

Narrow strips of METALITE Cloth wound spirally. Can be used on mandrel, or may be threaded like cord through holes for polishing and deburring edges.

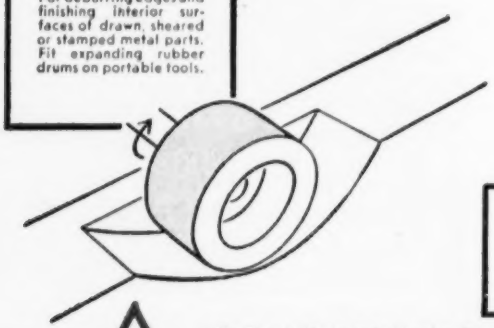


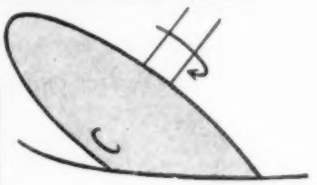
METALITE CLOTH SLOTTED DISCS

When pushed into a hole, the slots enable the sections to overlap, polishing the hole surface. Fine for radiusing and deburring drilled openings.

SPIRABANDS ®

For deburring edges and finishing interior surfaces of drawn, sheared or stamped metal parts. Fit expanding rubber drums on portable tools.





MUSHROOM* SANDING PADS AND DISCS

Shape and polish low areas as drawing-die work, deburr and polish edges, finish concave or flat surfaces.

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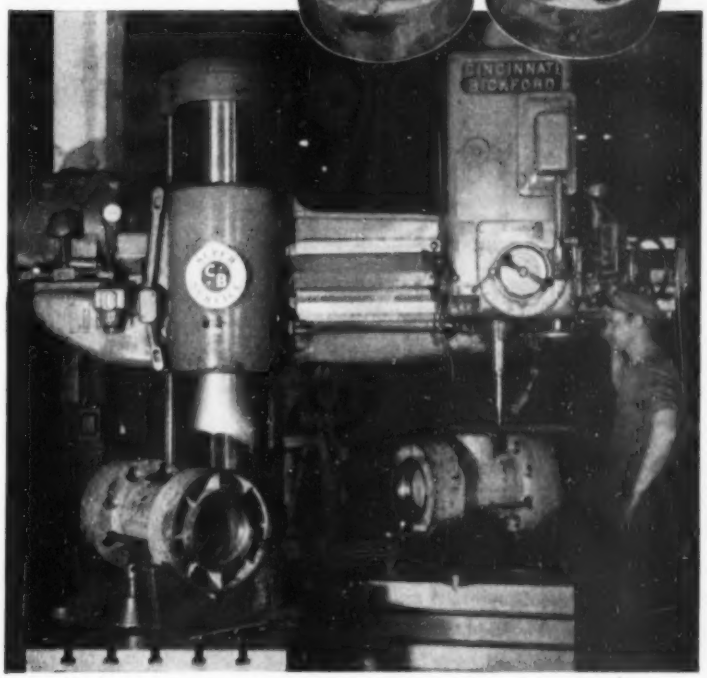
saving 2½ hours per piece.....

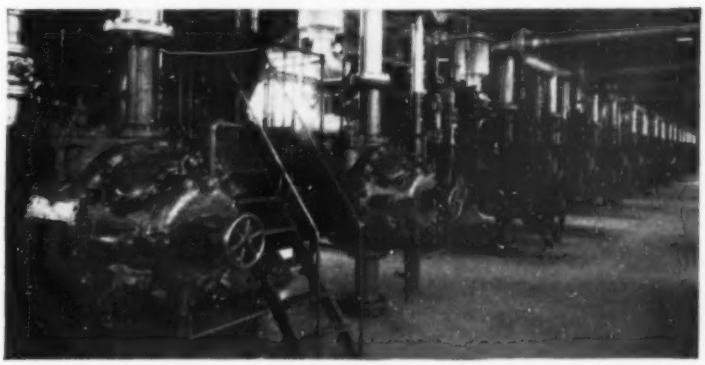


One of the battery of Cincinnati Bickford Super Service Radial Drills at work on compressor cylinder bodies.

Profitable experience brings satisfaction—and so you find 33 Cincinnati Bickford Drills of all types at the Grove City plant and 20 at the Mt. Vernon plant of The Cooper-Bessemer Corporation.

In the steel compressor bodies shown, and in the front and rear heads which involve similar drilling operations, $1\frac{3}{8}$", $2\frac{3}{32}$", and $2\frac{9}{16}$" holes are bored with a time saving over a previous machine of 2½ hours, floor to floor per unit.

Handling time was much reduced, and the outstanding convenience and ease of control, combined with steady, accurate performance and dependability, effect these marked operating savings.



Ten Cooper-Bessemer Type GMV six-cylinder gas engines of The Cooper-Bessemer Corporation at work in a large Canadian oil company plant. A Cincinnati Bickford Super Service Radial worked on these compressor cylinders.

CINCINNATI BICKFORD

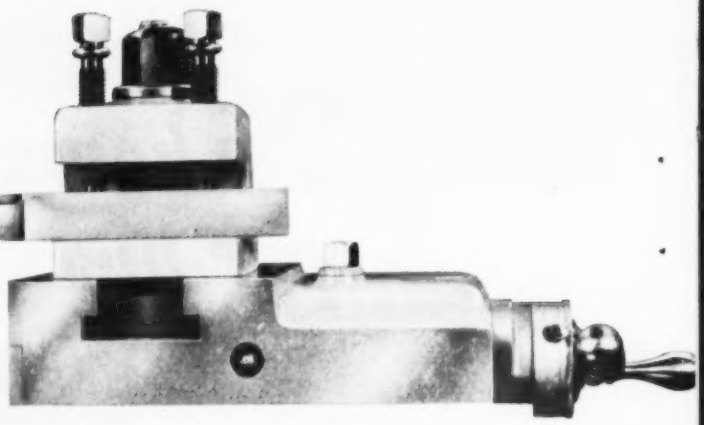
RADIAL AND UPRIGHT DRILLING MACHINES

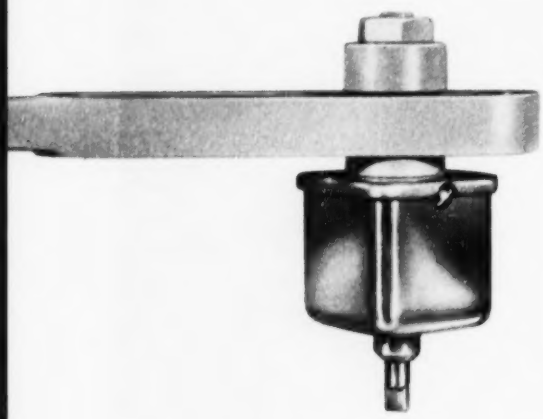
THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio U.S.A.

TOOL....

All the accuracy, rigidity and sensitivity built into Monarch lathes means optimum performance here.





...WITH ITS OWN NERVOUS SYSTEM...

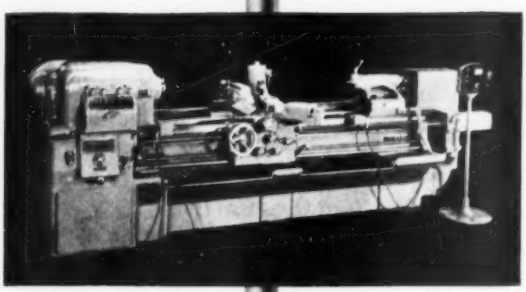
The Air-Gage Tracer is the most accurate lathe duplicating device yet developed. Change in template shape is converted to corresponding tool position change in a few thousandths of a second, tracer stylus operating on only 5 to 6 oz. pressure.

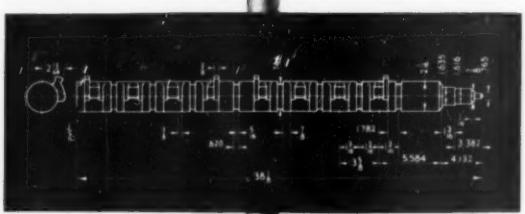
...AND BRAIN!.....

The Auto Cycle Unit is an *extra* push button control feature. Provides feed change as you need it... gives full automatic cycle operation... saves more time with fast traverse return.

Put all this together....

and you get the exclusive Monarch Air-Gage Tracer story in a nutshell. Higher output. Lower costs. Highest standards. Production at a profit. See typical job at right. Our Booklet #2606 gives many other examples, full details and specifications. Ask for it and see how tracer controls and Auto Cycle Unit can be applied to most Monarch Lathes. Write and indicate your interests... *The Monarch Machine Tool Company, Sidney, Ohio.*





FINGER LOCK BAR. *Material* — SAE 1045 forging. *Operations performed* — Turn complete.

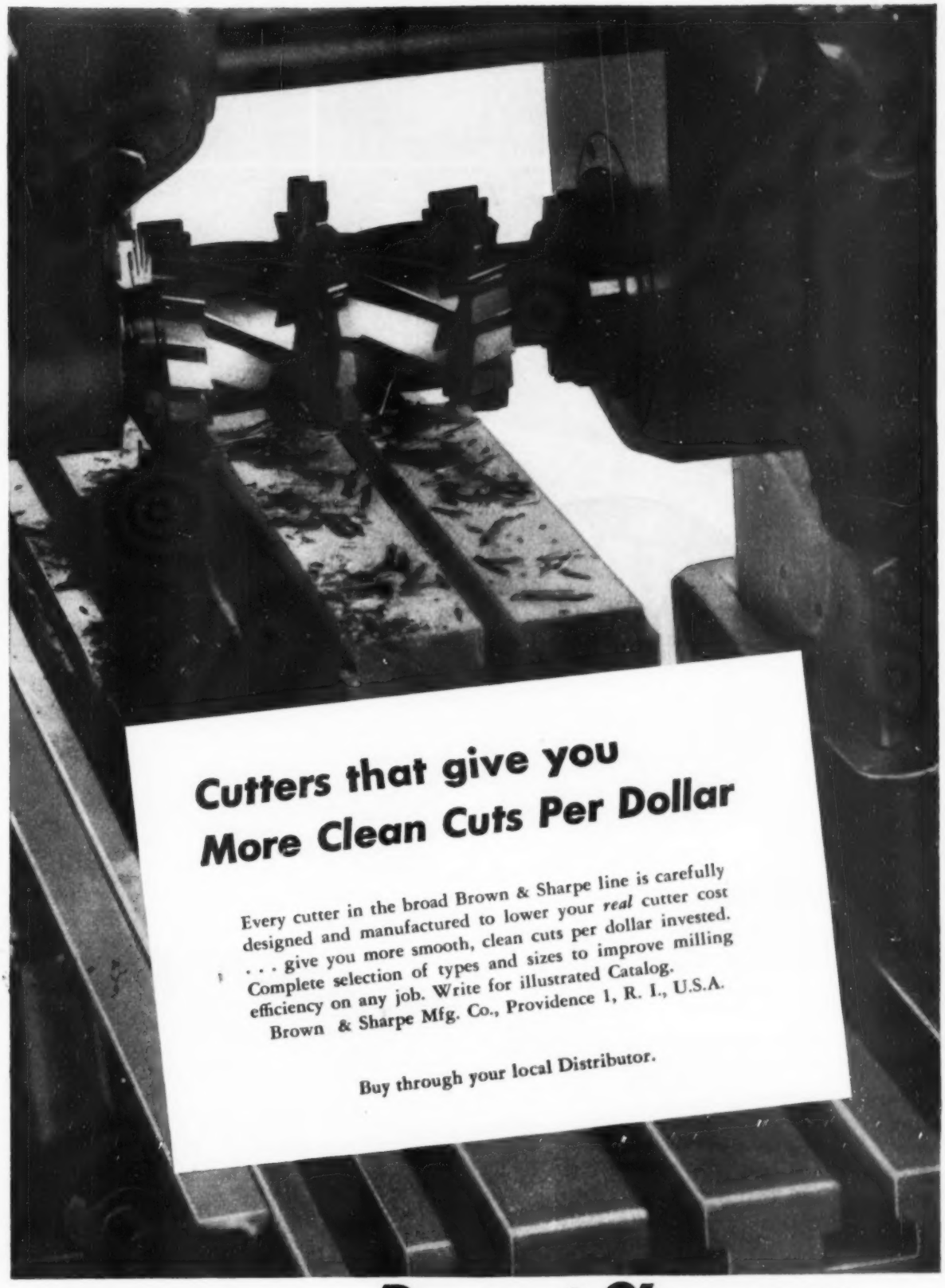
Machine — Series 60 Lathe with Auto Cycle Unit. *Total machining time* — 1 hour. *Time formerly required* — 4 hours.

Monarch

ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH



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Every cutter in the broad Brown & Sharpe line is carefully designed and manufactured to lower your *real* cutter cost . . . give you more smooth, clean cuts per dollar invested. Complete selection of types and sizes to improve milling efficiency on any job. Write for illustrated Catalog.
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Model 18105 Shear-Speed Cuts
Costs at Caterpillar

ONE SHEAR-SPEED* CUTS CATERPILLAR CLUSTERS

. . . in 1/8 the time!

In ONE HOUR, one SHEAR-SPEED shaper cutter cuts as many teeth on these final drive gear and pinion clusters as were cut by previous methods in EIGHT HOURS at Caterpillar Tractor Co. Less floor space is required, and the Shear-Speed has no trouble keeping up with production requirements. Both gears are cut on the same Shear-Speed.

The blank weighs 70 pounds—20 pounds of metal is removed in cutting the teeth. Cutting time for the 10.372" diameter, 27 tooth gear is 7.5 pieces floor to floor per hour; the 12 teeth on the 6.097" diameter pinion are cut at the rate of 6.5 gears per hour.

Twenty-one complete gears were produced in 8 hours by previous standard hobbing and shaping methods on 6 machines. Diametral pitches are 2.750 on the gear and 2.413 on the pinion. Face widths are 2 1⅜6" and 4⅜6".

*Registered Trademark

GEAR PRODUCTION HEADQUARTERS

MICHIGAN TOOL CO. DETROIT U.S.A.

COMPLETE from blank to finished gear

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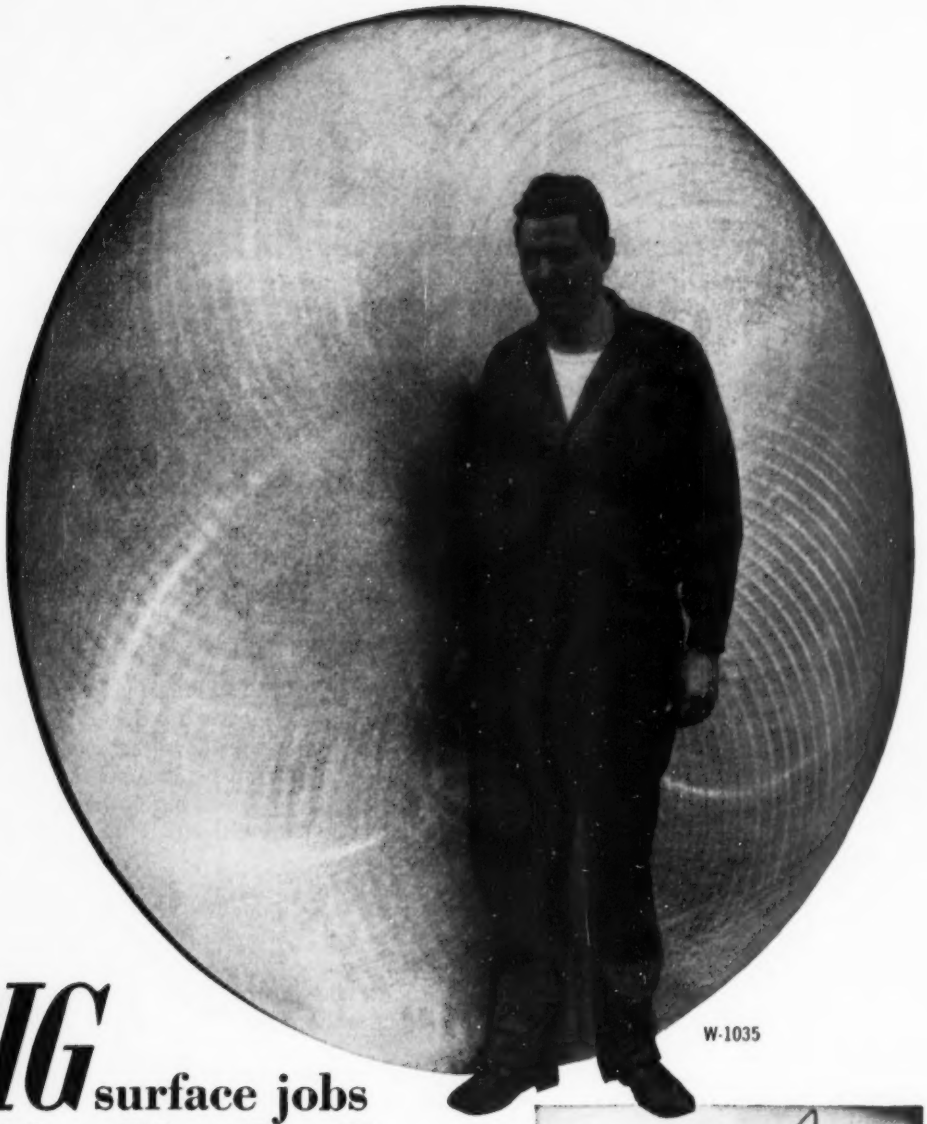


W-1035

Those *BIG* surface jobs are easy with a Blanchard!

No other machining method can match the speed, economy and quality of Blanchard Grinding on large flat surface work. This 88" diameter, cast iron plate, for example, was rough ground in 3½ hours, floor to floor. *¼" of stock was removed from one side —a total of 1520 cu. in.—380 pounds!*

After normalizing, finish grinding on the Blanchard produced a water-tight joint, with a Blanchard ground mating service, each being flat within .001". Why try to machine your large work with time-consuming methods, when Blanchard Grinding offers such speed, economy and quality with surprisingly low wheel costs?

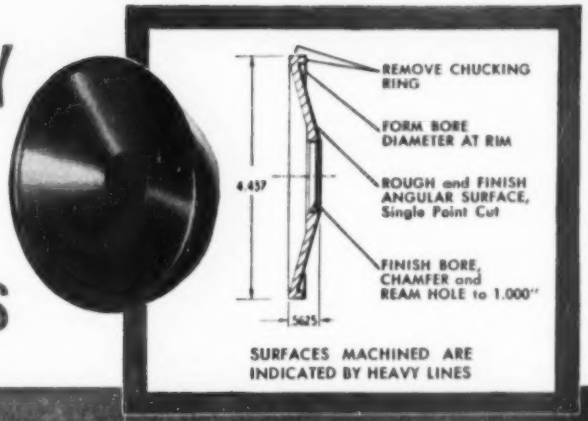
NO. 42-72-84 BLANCHARD SURFACE GRINDERS

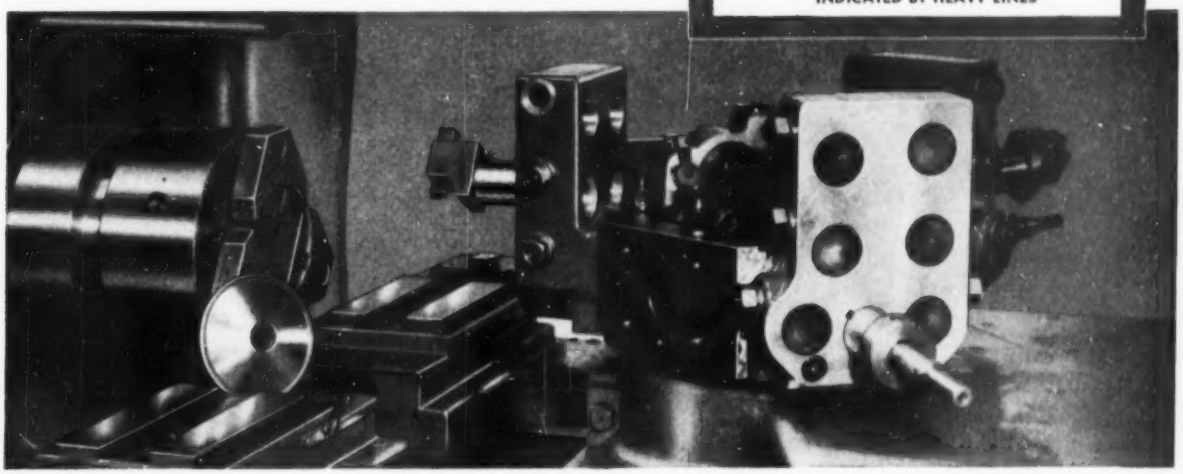
Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**

Here's an EASY WAY to machine Forged Steel End Caps


REMOVE CHUCKING RING
FORM BORE DIAMETER AT RIM
4.437
ROUGH and FINISH ANGULAR SURFACE, Single Point Cut
FINISH BORE, CHAMFER and REAM HOLE to 1.000"
.5625
SURFACES MACHINED ARE INDICATED BY HEAVY LINES



Use a 3U SPEED-FLEX Automatic Turret Lathe with P & J Tooling

Designed, engineered and built for rapid, accurate, economical production, the 3U Speed-Flex takes full advantage of carbide cutting tools for quick metal removal on a variety of small to medium size work. P&J Tooling will also make a big difference wherever the profitable machining of difficult jobs demands added efficiency.

FOR THE ULTIMATE in speed, precision and economy you need **both** P&J Automatics and P&J Tooling . . . industry's outstanding team for higher output, lower unit costs and improved work quality.

Machine your hard-to-handle jobs easier and better, the P&J way. Send today for your copy of the 3U Bulletin No. 145 — or ask the P&J Tooling Engineer to submit recommendations based on your own sample parts or prints.

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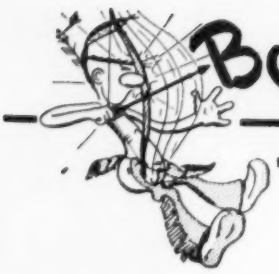


Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Rubber Stamp

Your article on using rubber stamps for drawings (*AM*—Jan 5 '53, p109) was very interesting and offers tremendous time savings in the drafting room. However, we do not have suitable engraving equipment and I am wondering whether these stamps can be bought ready made, as most of them are completely standard items as regards the type of tool.

H R Snyder
Detroit

We do not know of any company that produces these stamps as stock items, but most commercial rubber stamp makers could make them up from your own drawings.—Ed.

Ninety-Day Wonder

Under the heading, "Don't Tell Too Much" on the Talking Shop page (*AM*—Jan 19 '53, p289) I noted that there were several ways of interpreting this subject. Personally, I'm inclined to agree with the army idea of having the instructee repeat the instructions to make certain he has grasped the idea. As for the wisdom of the officer technique, I'm afraid the comeback would explode in the questioner's face.

My old friend, a machine-shop instructor who has long since retired, was directing one of his brainy youngsters on how to proceed with lowering a countershaft. The boy, evidently of officer quality, shot question after question at his mentor for fear he would do something wrong. The "Now what'll I do?"—"Now what'll I do?"—"Now what'll I do?" became rather monotonous and exhausted the instructor's patience. Finally, in utter disgust, he headed for his desk. "What'll I do with the rope?" called down the boy. "Tie one end to that timber and the other around your neck, and jump," was the answer.

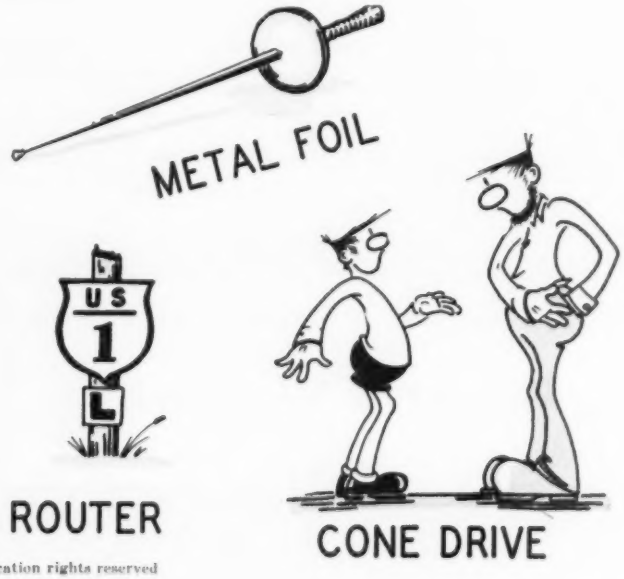
John Homewood
Ontario, Calif

Pravda

Referring to your Talking Shop item under the heading "Comrades" (*AM*—Jan 19 '53, p289), you refer to a

GRINETICS

BY D G SMITH



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FOR PRECISION

PLUS PRODUCTION . . .

PRECIS-O-NIZING

OLD mass production methods are not enough to satisfy a market that is demanding both *quality* and *lower prices*.

Only through modern precision-production techniques can a manufacturer hope to use this two-edged sword to his own advantage!

Because of this need for a productive method of generating precision . . . the Microhoning process was evolved. For a quarter of a century the Micromatic Hone Corporation, working with industry, has led the honing field in the development of equipment that would productively finish parts within the ever-shrinking tolerances of new designs and standards.

This applied precision-adeptness of the Microhoning process is "PRECIS-O-NIZING".

In one economical operation Microhoning abrades stock rapidly and efficiently with a minimum of heat to generate—

—bores that are round and straight
—accurate diametric size
—a functional characterized (cross-hatch pattern) surface finish that is free of smeared or distorted material.

The processing of sewing machine parts is an example of PRECIS-O-NIZING.

Microhoning equipment is available to handle all kinds and sizes of parts . . . from soft non-ferrous metals to hardened steel and special alloys . . . from .078 to 60 inches in diameter and from ¼ inches to 75 feet in length.

MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

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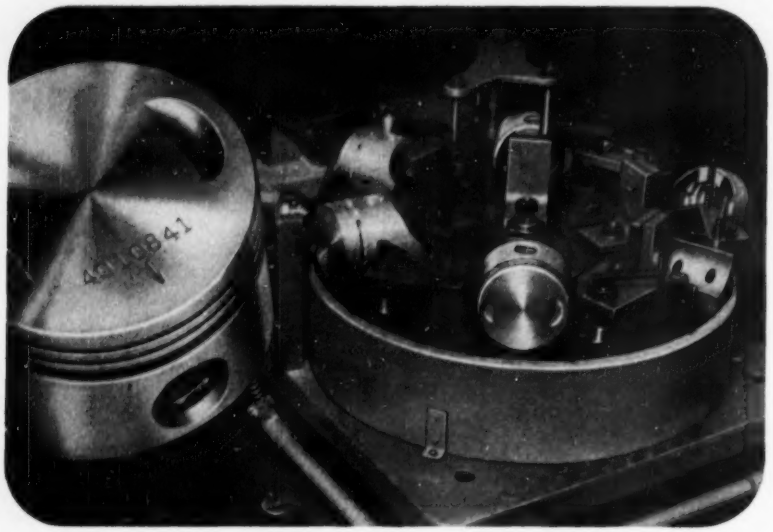
LEADERS IN INDUSTRY MARK WITH NOBLEWEST



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The new Model 342 (illustrated above) is another fine example of Noblewest's unique ability to provide industry with high speed marking equipment for part numbering, trade marking, or date coding. This model was especially designed for permanently marking and ejecting approximately 2500 pistons per hour with absolute uniformity of impression. Basic model (right) can be tooled for marking many sizes and shapes of component parts in metal, plastic, hard rubber and wood. Whatever your needs for marking, Noblewest makes the machines, tools and dies to do the job *faster, better at lower cost.* For complete details, write Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Conn.

• • • • • • • • • • • • • • • • •

Noblewest is equally famed for fine marking dies . . . made to the most exacting standards of quality . . . yet, they are competitively priced.

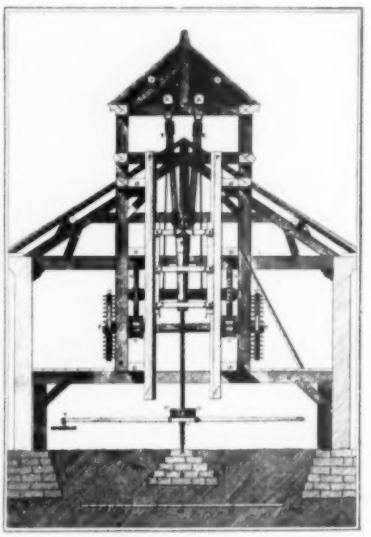
"Baley-Lainen" lathe which you claim nobody has ever heard of.

For your information, I wish to tell you that Boley-Leinen is a German outfit located in Esslingen N., near Stuttgart, Wuerttemberg. This company has manufactured precision lathes in quality and style similar to the American Rivett and Hardinge lathes for approximately 40 years and is well known in Europe.

It is possible that these people have some unusual attachments for their machines to obtain maximum production. However, I doubt the yarn about the lubrication mechanism. Maybe you can inquire directly.

Hans Bonheim
Atlas Recording Machines Co,
New York

Thank you for the information on the correct name of the lathe. It chalks up another error against Comrade Spiridonov. We don't believe the yarn, either. In the meantime, we will try to find out more about the company in question. Then we'll publish Truth, not Trud.—Ed.



Old Art

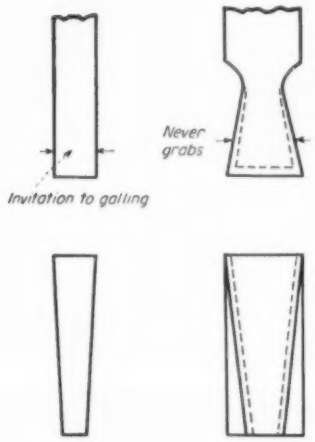
Going through some old issues of *AM*, I noticed some references to upside-down drilling which gave me the impression that it was considered as a relatively new development. I would like to point out that it is really very old.

In his magnificent work "The Gunfounders of England" Charles Ffoulkes describes this process and shows a picture of the machine. The drill was rotated by a horse or ox

yoked to a long arm, and the cannon was lowered by block and tackle, its entire weight resting on the drill point. The machine was invented in 1713, and by 1747 all cannon were required to be bored from the solid instead of being cast hollow.

Setup on this machine was so difficult that it was soon superseded by a horizontal boring machine invented a short time later. I believe the original description of the vertical machine, and the drawing, appeared in Diderot's Encyclopedia published early in the 18th century.

T Webster
Buffalo



Mutual Agreement

A reader asked in a recent issue (*AM* —Jan 19 '53, p 107) whether or not a French machinist's claim that a lathe cutoff tool works better if mounted upside down, is substantiated. We do it that way in Belgium. Here's why. With the tool mounted upside down, the downward thrust is on the solid mass of the headstock and bed. This tends to reduce vibration and chatter. With conventional mounting, the up-thrust is against the half-bearing caps. Obviously, this is not as massive as the bottom half, so there is less bulk available to absorb vibration.

It is also the trend, over there, for lathe hands to prefer solid forged, swan-neck cutoff tools to commercial blades and holders, particularly if the latter have no side axial clearance. Incidentally, we like to use a chip breaker, too.

I have become accustomed to the American-style cutoff blades held in the conventional manner, but you couldn't give them away over there.

A T Renson
Atlanta,Ga.

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Machine Grinding Is Best For Drill Sharpening • It's More Accurate • More Reliable — Do It The Oliver Way

Your Drills Will

- **cut faster**
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It is important to remove twist drills from the drilling machine and replace them at the first sign of dullness. Better yet, allow them a certain number of hours production or a certain number of parts produced — then *play safe* • protect your production run • sharpen them *correctly* on an Oliver Drill Pointer. Oliver Drill Pointers give balanced cut, with each lip doing equal work, eliminating the excessive drill costs and imperfect holes usually traced to improper drill grinding.

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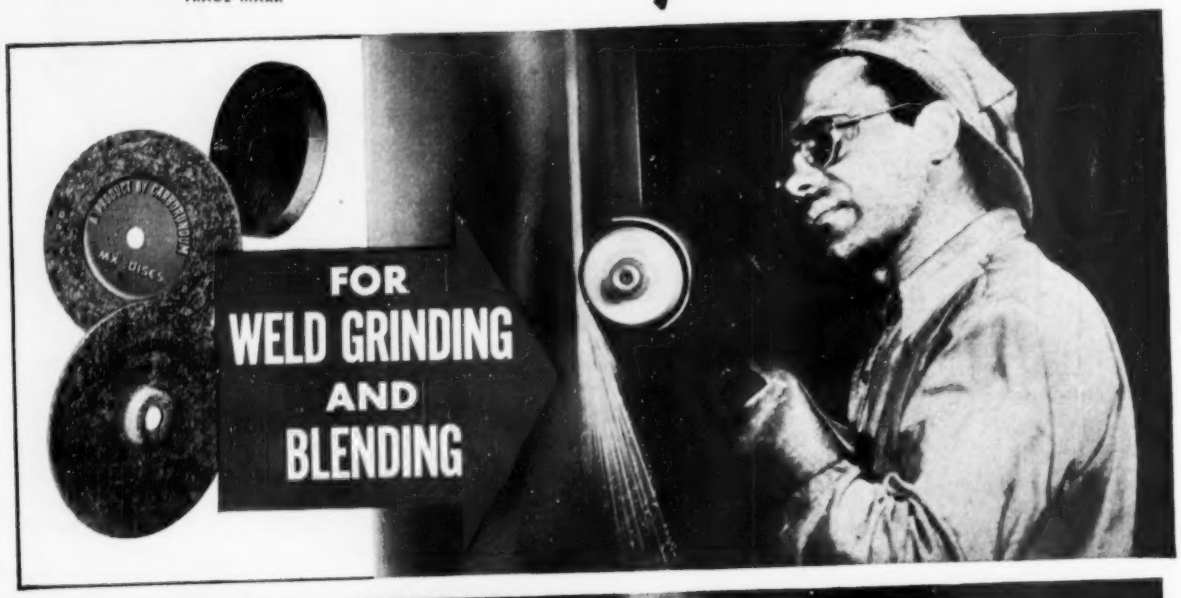
TRADE MARK



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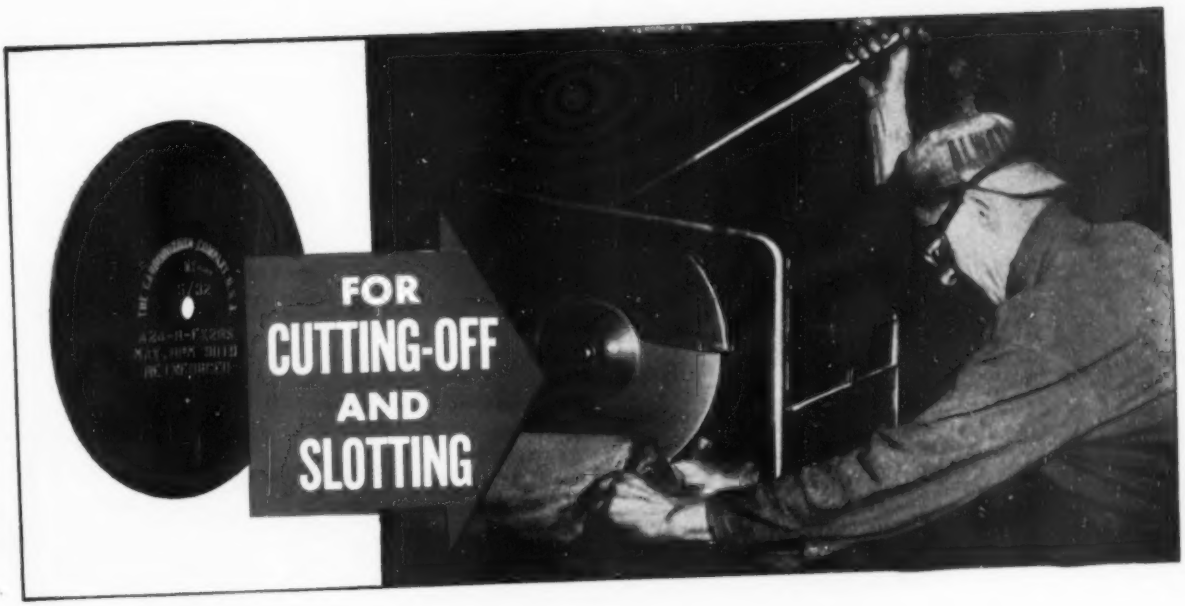

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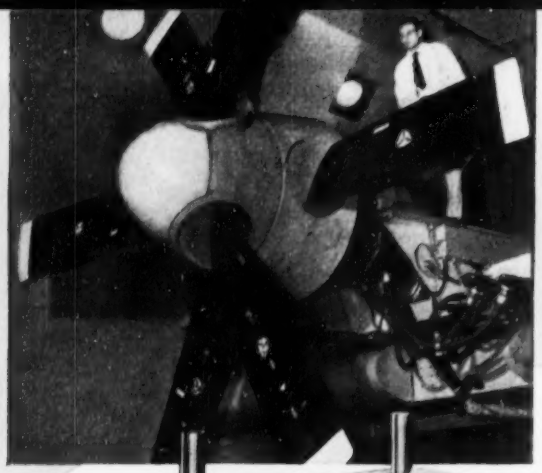

High speed aircraft propeller on test stand—built from tools "spotted in" in a DANLY SPECIAL DIE SET.

DANLY SPECIAL DIE SET, 46 by 140 inches, used for both production and checking of aircraft propeller tools.

DANLY SPECIAL DIE SETS

Final checking of a brazing fixture after "spotting in" to the master. A bridge gage is used with a series of templates as shown.

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SPOT NEWS of Metalworking

- **Plymouth's new semi-automatic transmission will sell for $135.** "Hy-Drive," combining torque converter and Synchro-Silent three-speed transmission, requires a clutch for shifting from neutral to high upon starting. After that, shifting is automatic, including stops and re-accelerating. Manual shifting is possible for engine braking on hills, bad road conditions. Hy-Drive's fourth forward gear is an overdrive that cuts engine speeds 30 per cent at speeds over 25 miles per hour.

A jet fighter plane that can take off vertically and fly at speeds exceeding 1000 mph will be ready in less than two years, according to Canada's Air Vice Marshal Douglas Smith. The disc-type plane, now on the designing boards at Canada's A V Roe Co, will be built on the gyroscopic principle and will be able to rise vertically into the air without the use of runways.

- **Non-ferrous foundries are suffering from aluminum scrap shortage.** Most of them are operating on a part-time basis. The reason: aluminum scrap dealers, anticipating relaxation of controls, are looking for higher prices.

- **Declining farm income is causing a drop-off in farm machinery orders,** according to F E Myers & Bro Co, Ashland, Ohio, manufacturers of pumps and farm equipment, whose five-day work week has been cut to four days because of a sharp drop in incoming orders.

- **Powdered iron magnetic clutch will be reintroduced this spring** by Eaton Manufacturing Co, after its abortive attempt in 1950. Bugs have been ironed out of the clutch and hundreds and hundreds of tests have been completed on Fords and other car makes. Eaton is now ready to push sales of the clutch.

- **GM's Fabricast Div is building a permanent mold aluminum foundry** at Jones Mills, Ark. Much of the casting output will be used in torque coverter transmissions. Pilot plant, employing 175, is already set up.

- **Kaiser-Frazer hopes to get its fiberglas convertible out by July.** If so, it will be the first to mass produce and market a plastic-bodied car. DKF-161's body shell weighs only 300 lb. Its road weight of 2000 lb makes it about 1500 lb lighter than most US convertibles. L-head, 6-cylinder engine develops 100 hp, with 8 to 1 compression ratio. Another feature: three in-line carburetors.

- **Even if military steel needs rise 2 or 3 million tons** this year, more steel than ever before will be available for civilian uses, according to Inland Steel Executive Vice President J L Block, speaking to the Industrial College for the Armed Forces in Washington recently. He also predicted steel operations will slack off to 90% of enlarged capacity in the second half of this year.

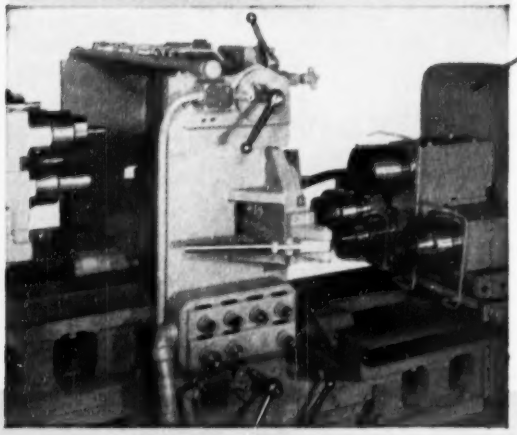
Millions of dollars worth of copper can be recovered from mill waste piles by means of a process developed recently at Michigan State College. Key to the process is a coal-tar product that removes copper silicate from the waste dumps that have been accumulating for some 40 years at the nation's copper mills. Copper silicate is separated by the "flotation" process, then acid treated to produce pure copper, yielding up to 90% recovery.

- **Stretch-out in arms production may be in the offing.** Defense Secretary Wilson wants to slash the budget's request for $20 billion new military procurement. Military high-ups claim any cuts made now will have to be tacked on at the end of the current defense production program in 1955. (See story on page 142).

- **Republicans and Democrats are both apathetic toward Taft-Hartley** revisions. Looks like nothing will be done about it at least until mid-summer. (See story on page 143).

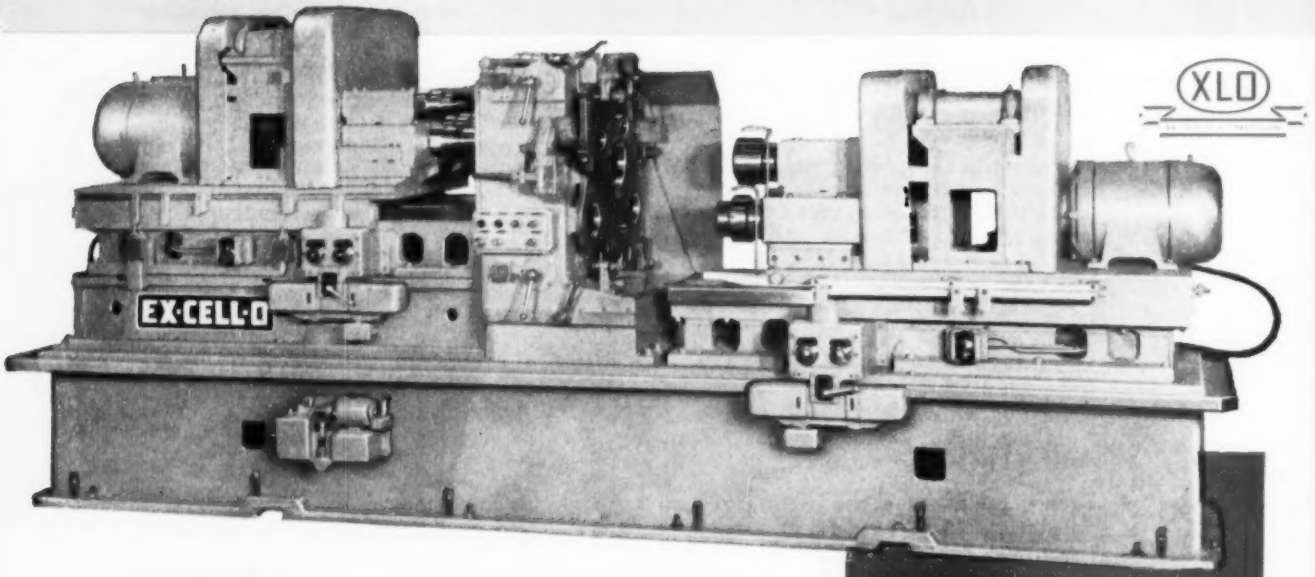
- **Welding speeds up to 50% faster** are said to be possible with a new submerged arc welder just developed by Lincoln Electric. Welder features two electrodes in a single head.

Individual spindles are used for each bore to insure accuracy of location.



27 PRECISION OPERATIONS ON 9 HOLES IN ONE CYCLE

Another example of EX-CELL-O PRECISION ENGINEERING



SITUATION: The part is a magnesium center plate for a gear box. It's 27½" high and 30½" wide, has holes varying in size from 1⅛" to 6 15/16". Operations are semi-finishing, finish-boring and chamfering 8 holes, and finish-boring, plunge-facing a shoulder and chamfering the 9th hole, which is blind—a total of 27 precision operations.

SOLUTION: The use of this special precision boring machine makes it possible to complete all operations in one cycle, and to hold the required limits. The total tolerance on each of 9 bore diameters is .001", and the location of the bores are held within plus or minus .001".

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53-1

Washington

How freely should priorities be issued to steel, copper, and aluminum consumers after June 30, when CMP folds up? This is becoming a big question as defense mobilization planners begin ironing out a post-CMP controls scheme.

Steel producers have recommended that priorities be granted only to direct Defense Dept and AEC contractors and subs. This would force the so-called defense-supporting industries—like electric power, petroleum, and railroads—to scramble for metal supplies along with manufacturers of civilian-type products.

The defense-supporting industries and their government claimant agencies are howling mad at this proposal. They want the same treatment as the military.

Top mobilization planners themselves are undecided on how far to go with priorities. They recognize the needs of the defense-supporting fields. But they're hesitant about getting bogged down in the establishment of bands of relative essentiality for various industries. It was this type of problem that wrecked the old DO-rating system before CMP became effective.

• • •

Price and wage controls are just about dead—but prosecutions of violators won't end completely. Any violation committed before price-wage regulations were ended can still be prosecuted—but chances are no one will be investigated unless he's already under suspicion.

Keep your wage-price records, though, whether you had any trouble with controls enforcement officials or not. The law requires you to keep them two years. That's important—some companies that ignored pay ceilings during World War II are still fighting their cases with the Bureau of Internal Revenue up through the tax courts.

• • •

Except for Taft-Hartley revision, don't look for any labor legislation this session. This is what's happening: civil rights—the Ives Compulsory Fair Employment Practices Bill has bipartisan backing again. It got through the Senate committee last year, may pass the Senate this year. The House would kill it.

Minimum wage—the Labor Dept is getting up a survey to back bills asking for a $1 minimum wage. It will try to show a 95-cent minimum would have the same effect on payrolls that the increase from 40 to 75 cents had in 1950. Actually, Korea came along to soften the full impact of the 1950 boost.

Walsh-Healey Minimums—the $1 minimum wage on public contracts in cotton manufacturing is being tested in the courts under the Fulbright Amendment. Industry would like to repeal the law. Labor wants the amendment killed. Nothing will happen this session pending the court test in cotton textiles.

• • •

Chances for a tax cut this year keep looking dimmer. Eisenhower now stands fairly solidly for no reduction of any kind until a balanced budget is in sight. That means he's against ending the Excess Profits Tax June 30—unless Congress makes up any revenue that would be lost by letting the EPT die.

Chairman Dan Reed of the House Ways and Means Committee is the spearhead of the drive to cut both corporate and individual income taxes on June 30. As things stand now, it looks as though the tax situation will be moving sidewise until the Eisenhower budget cuts can be measured.

Actually, the tax squabble—mainly inside the Republican party—will go on hot and heavy right down to the finish, whatever the outcome is.

• • •

Fathers will be drafted by this time next year. About 3.5-million men are deferred right now, of which 1.4-million are fathers. And there are only 1.2-million classified 1-A. But of the eligible group, only about 200,000 have been examined. Selective Service Director Lewis Hershey estimates that Selective Service will have to dip into the deferred classes. That means fathers as well as college students.

Out of a two-year service period, the Army is now getting only 14 to 18 months of useful service from a draftee.

General Van Fleet is reported to want this period increased to 3 years. But Hershey is against extension of required service. Reason: it would not distribute the burden on an equitable basis. Hershey would rather wipe out all but the most essential type deferments.

Chances are best that deferments will be cut rather than service periods increased.

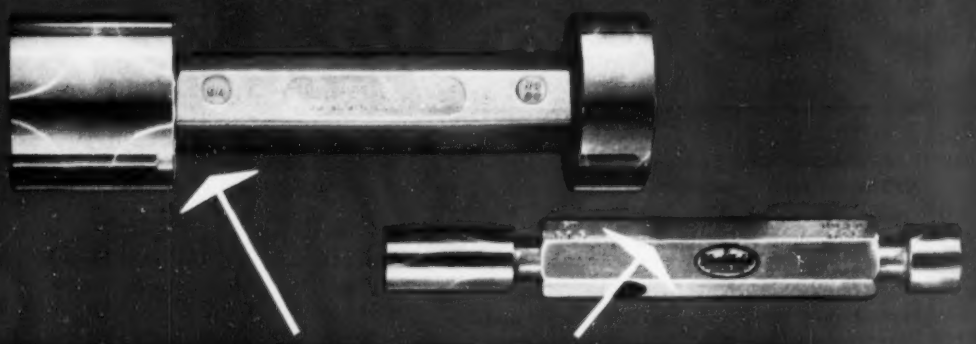
• • •

Overseas competition may get tougher for metalworking industries soon. Answer seems to be: get ready to sell more in export markets.

It's still too early to tell how far Eisenhower will go in lowering tariff walls, but moves are afoot to cut customs red tape, end "Buy American" legislation.

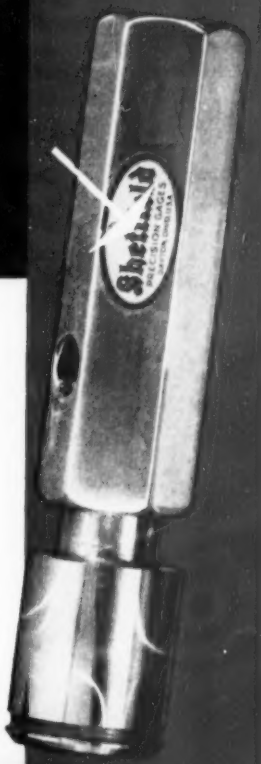
NAM, CED, Chamber of Commerce, CIO and farmers favor free trade instead of aid. AFL is wavering on the question.

Watch these developments for a tip off on which way the trade wind will blow: (1) The President's disposition of MSA's trade policy report, (2) White House's stand on lower trade barriers when the Reciprocal Trade Agreements Act coems up this spring.



SHEFFIELD PLUGS and RINGS

NEW PRICES



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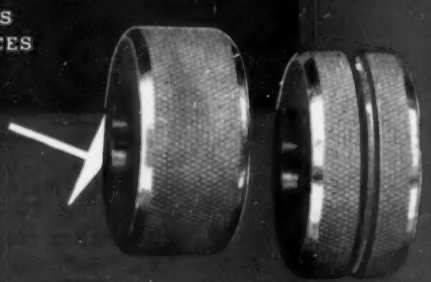

REPRESENTATIVES IN PRINCIPAL COUNTRIES

In Australia, the Sheffield Corporation of Australia Pty. Ltd., Melbourne

Detroit

Publicly they won't talk, but privately many independent auto companies are not entirely happy over the ending of automobile quotas.

They're bothered on two counts—(1) that the Big Three will now have the way clear to building much more and getting bigger shares of the market; and (2) that in so doing the Big Three are liable to drive remaining steel supplies into a corner so that prices would be even higher than at present.

There isn't any black market steel in the old sense, not at all. But there are thousands of tons of conversion steel in process and contracted for. That's made it tough for the smaller producers. And there are thousands more tons of steel being acquired by the major makers from warehouses—and there will continue to be.

The General Motors-Ford rivalry, which is burning at high heat behind the scenes, is responsible for a fair share of this absorption of available steel. In their efforts to outdo each other, both companies have been snapping up sources as they could find them. The little fellows don't like it, but there's not much they can do about it—particularly since they intuitively (like all other business firms) favor a free market rather than one whose tune is called by the government in Washington.

• • •

Automotive employment is at all-time high levels. In January the car, truck and parts plants had 940,000 people on payroll. That's just above the previous record of 936,000 in March 1951, far ahead of the wartime peak of 827,000 in January 1944.

For the moment the situation isn't changing. Pressure for more help is abating—the companies are pretty well geared to their present pace, and they won't vary much for a month or two, maybe more.

Production reflects this stability. With controls off, volume won't vary materially from current levels of around 150,000 units a week (cars and trucks, US and Canada included).

It might have been different, were there more steel. Cold rolled is the hardest to get.

• • •

Releases are coming out on a Dodge transmission program. A new torque converter transmission, accordingly, may be seen in the 1954 dodge models.

Machine tool people, meanwhile, are anticipating early releases on the new Chevrolet V-8 engine. This powerplant is still tagged for 1955 model installation, but if the releases don't appear before very long, the sources may be hard put to give them complete production lines in time for that deadline.

The hardtop is certainly the glamour car. A recent compilation by Ward's Reports showed 13% of 1952 output was in the hardtop classification, compared with 9% in 1951. This gain was achieved at the expense of two-door sedans and club coupes. The four-door sedan, incidentally, retained its traditional leadership; it accounted for 52.4% of total output in 1952; in 1951 this ratio was 50.6%.

• • •

Meanwhile, total passenger car registrations in 1952 of 4,158,394 cars proved the fourth highest on record, surpassed in each of the three preceding years. Truck registrations of 812,099 last year made it the sixth best year, exceeded in each of the preceding five years.

• • •

Herman L. Weckler announced his resignation as operations vice president for Chrysler Corp. He was due for retirement in the fall, and his announcement appeared to have surprised the company. Officials were quoted as saying they had thought he was on vacation.

Chrysler's annual report shows that expenditures for improvement and additions to land, buildings, machinery, and equipment totaled $65,485,711 in 1952. Additions to tools, dies, jigs, and fixtures, amounted to $56,144,141. The large items: re-equipping plants for new car and truck lines in all divisions; installation of the Dodge engine line; establishment of a West Coast passenger body facility.

Chrysler of Canada will spend $17 million in the next five years to double capacity at its Windsor plant. Additions are planned to the passenger car facility, the powerhouse, and the export division.

• • •

Ford's Dearborn stamping plant is now producing truck body parts formerly made by outside manufacturers. The plant is equipped to turn out door, hood and fender assemblies, back, floor and roof panels, and upper and lower grille sections for most models in the line. Some 79 punch presses have been assigned to those schedules; they are also used for passenger car body parts.

• • •

Out of the blue comes Fisher Body's decision to double output of Chevrolet and Pontiac station wagon and sedan delivery bodies at its Cleveland wagon plant. A second shift will be added immediately.

• • •

Chevrolet is also stepping up Powerglide production at its Parma, Ohio, plant, where 700 new employees will be needed. Original Cleveland Fisher Body plant has added 1100 workers since January 1.

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Machine Tools

Ford Motor Co is planning to spend as much as $200 million for machine tools and allied production equipment the next few years.

This is more than a pipedream. The company's representative lately has been visiting key machine tool builders to find out how much of their capacity will be available in 1954 to take care of this program.

• • •

For one thing, Ford is interested in pinning down the capacity that it thinks it will need so that it will not be blocked by any program that Chevrolet or any other company may come up with.

Despite huge expansion of facilities the past five years, Ford still seems to feel that it does not possess enough capacity for building V-8 engines. But the Ford program as a whole goes far beyond just engines and encompasses many other manufacturing operations.

This significant development is believed to be the forerunner of much automotive buying of machine tools in the near future.

Purchases by the automobile industry have been of considerable size since the first of the year.

• • •

Defense Department's $500 million earmarked in the fiscal 1954 budget for long-lead-time machine tools (the "elephant" program) is almost sure to be okayed by Congress.

This would be the initial step in carrying out the recommendations of the Vance Committee.

• • •

Not all the money may be used for machine tools, however. Around $100 million is likely to be set aside for buying or leasing plants on a standby basis. These plants would be acquired from manufacturers who erected them, with fast write-offs, for production of military goods.

Cutbacks in the defense program have made operation of these plants unprofitable.

Some of the owners now want to convert them to production of civilian goods. Pentagon is reluctant to see these facilities thus used.

• • •

No one seems to know, for sure, whether some of the current purchases and prospective orders for "elephants" may not be for the "over-tooling" phase of the defense program rather than for nearby needs.

Some of the current buying by the armed services probably is, for all practical purposes, a start on the Vance program, without being so labeled.

Munitions Board is reported working up a list of machines most urgently required that would be bought with the $500-million fund.

Still to be decided is whether the money would be appropriated to the Secretary of Defense for allocation to the individual services, as outlined in President Truman's budget, or to the services for their own use. Latter alternative stands a good chance.

Machine-tool orders rose in January to 248 on the National Machine Tool Builders' Association index. That compares with 220 in December.

Shipments in January were at 348, against 354 during December, preliminary figures show.

• • •

The European Committee has decided not to hold a European Machine Tool Show in 1955. That is the year that the National Machine Tool Builders' Association is tentatively scheduling a show in Chicago at the International Amphitheater. The date will be the first two weeks in September.

Third European Machine Tool Exhibition will be at Brussels next September 4 to 13. Site will be the Centenaire exhibition halls on outskirts of the city, with 30,000 sq meter (322,500 sq ft) of display space.

German machine tool builders have applied for 12,000-15,000 sq meters of space; France 4000-5000 sq meters; Belgium 3000; Italy 3000; Switzerland 1500; Netherlands 500.

• • •

British builders are expected to exhibit in considerable numbers, though the British have not joined the European Committee.

Charge for space is 1500 Belgian francs per sq meter. For this charge, services will be the same as at Hannover last year.

Hermann Heller is president of the Exhibition Committee. He was director-general of the Hannover Show in 1952.

Emmanuel Pouvreau, French machine tool builder, has been elected president of the European Committee for a two-year term.

• • •

Milano, Italy, will be the seat of the show in '54. No decision has been made as to the timing of any European Show after next year's.

The French would like to see it held in Paris in 1956, it is believed. By that time a new large exhibit hall, conveniently located, will have been completed in Paris.

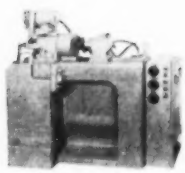
The British are reported to have reserved Olympia in London for their next show in May or June of 1956. September was first choice, but Olympia will not be available then.

BF

bryant
internal grinding

no. 1309-W

Finishes 2 bores and a taper straight and concentric. 2 wheelheads are used on this semi-automatic. Max. traverse stroke, 6". Max. grinding length, 3½".

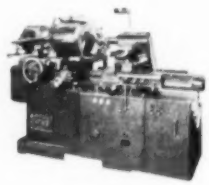


no. 1109

For high production of small bores where accuracy of size and finish are required. Max. traverse stroke, 6". Max. grinding length, 3½".

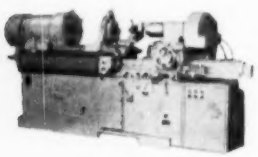
no. 1316

Two wheelheads for high production of jobs requiring face and bore, or face and O.D. grinding. Max. traverse stroke, 20". Max. grinding length, 8".



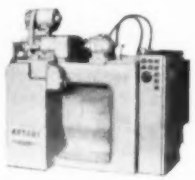
no. 1116

A general purpose hole grinder for tool room, small shop, or general production. Maximum traverse stroke, 20". Maximum grinding length, 8".



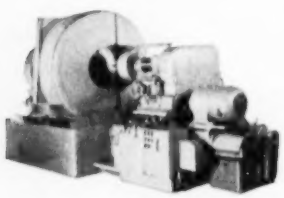
no. 1416

Specially designed for grinding bores in long work, such as machine tool spindles. Maximum traverse stroke, 20". Maximum grinding length, 8".



no. 1209

A fully automatic, high production machine for small and medium bore grinding. Max. traverse stroke, 6". Max. grinding length, 3".

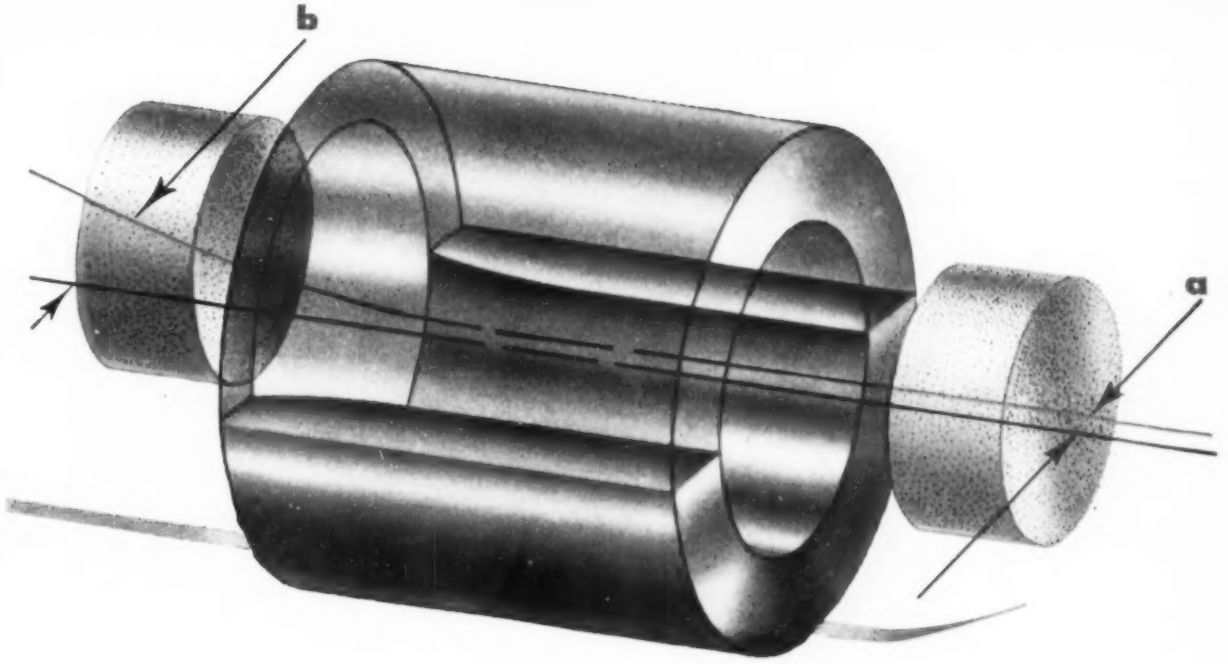


no. 1460

For production or single piece hole grinding on parts up to 60" diameter. Max. traverse stroke, 21". Max. grinding length, 16".

no. 2209

For precision and high production grinding of ball bearing races, gears, rolls, bushings, etc. Max. traverse stroke, 6". Max. grinding length, ¾".



BELL mouth holes are a common internal grinding error. General available information advises simply turning the workhead or changing the length of traverse to correct this error, to generate a straight hole. In the case illustrated above, where bell mouth exists at one end of the hole, neither turning the workhead nor changing the length of stroke will correct this error.

In order to grind a straight hole the wheel must traverse the work in a straight line parallel to the axis of the work. The wheel path (the line in which the wheel traverses) is controlled by the slides under the wheelhead. If the slides are straight and true, the wheel path will be a straight line. If the path of the wheel varies from a straight line, the variation will be generated in the work.

At point "a" the wheel path and axis of the work are parallel and the wheel is set to grind a straight hole. Because of an error in the wheelslide ways, the wheel path is distorted and the wheel is plunged into the back end of the work and the wheel path and work axis diverge as shown at point "b". Wheelslide error can introduce distortion of many types within the work in addition to the one illustrated. The remedy is to correct the wheelslide ways which will, in turn, straighten the wheel path. The wheel contact will be improved, resulting in better finish.

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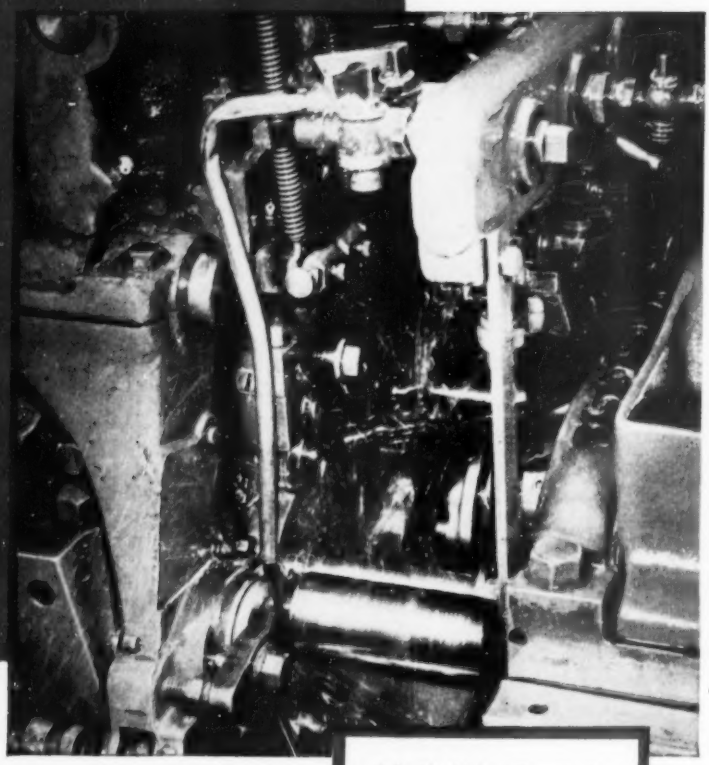

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Machine: Davenport Automatic
Metal: #416 stainless steel
Coolant: Texaco Cleartex Oil AX

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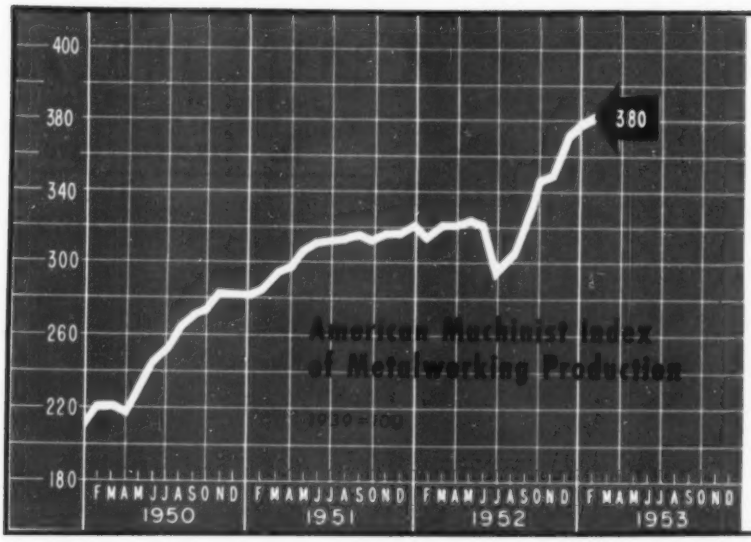
Gaging Metalworking



PRODUCTION INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	FEB '53(*)	JAN '53(p)	DEC '52(r)	JAN '52
	380	**377**	**372**	**315**
Machinery	342	338		307
Electrical Machinery	429	424		362
Autos	296	296		217
Other Transportation	612	592		494
Other Metalworking	375	371		312

(*) Estimated (p) preliminary (r) revised

Metalworking production has gone through the roof. It has exceeded all expectations since late last summer, with each month showing a gain over the previous month.

American Machinist Index reached the astounding figure of 377 in January, with 1939 taken as 100. February is estimated at 380.

There is nothing ahead to indicate a decline from this dizzy height the next few months.

Last August the index was at a precarious 303. Only a very modest upswing was anticipated in the fall. No one foresaw the powerful upward movement which has carried the index within less than 100 points of the all-time high reached in the middle of World War II.

• • •

The impression deepens that defense production is the main factor contributing to Metalworking's sensational rise.

Most of the time in 1952 was devoted to tooling up. Now volume production actually is under way.

• • •

But don't overlook the influence of the automobile industry. It is going full tilt and promises to keep up the pace indefinitely.

Auto parts suppliers are feeling the effects of increased schedules. One big company, for example, foresees operations at full capacity well into the third quarter. Other parts makers are getting orders which will carry them through the summer.

Foundries serving the automobile people report the same favorable developments. Screw machine products shops, worried recently by the outlook, are having any slack taken up by Detroit orders.

• • •

Aircraft parts manufacturers say that business is steady and will continue that way.

Some parts contractors have attained peak output 2-3 months ahead of time. Schedules will stay at the peak through the spring or longer.

The next six months look good to domestic appliance makers. The situation is very good in refrigerators, which comprise such a sizable ratio of the industry's total dollar volume.

• • •

Steel mills have about all they can do through the first half and well into the third quarter. Order books are closed through June. Only cause for worry is business in the final four months.

Merchant wire products are moving out from mills at far less than normal for this season of year.

Manufacturers are not sure whether farmers are balking at prices and are not buying, or whether dealers are refusing to stock. In any case, business is not flourishing as it should.

• • •

West Coast aircraft makers look for a big year, with some expansion as the months go by.

Manufacturing in southern California, however, dropped a bit in January from December's postwar high.

Shipbuilding is not doing so well on the Pacific Coast. Most of the yards are running at far less than capacity.

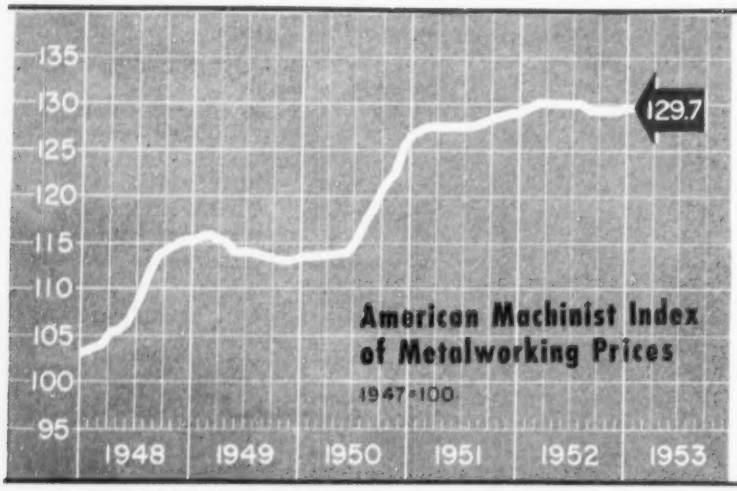
One reason is that some of the Navy contracts have been completed and new orders are small. Business from the fishing industry has been light in the smaller yards.

• • •

In Seattle, Boeing employment is at 30,600, which is up 2500 from a year ago.

Second quarter outlook in much of Metalworking on the West Coast is only fair.

Gaging Business



PRICE INDEX

	FEB '53(*)	JAN '52(p)	DEC '52(r)	JAN '52
	129.7	**129.7**	**129.7**	**129.7**
Metalworking Machinery	**137.8**	**137.8**	**136.2**	
Other Machinery exc. Electrical	**132.3**	**132.3**	**132.8**	
Electrical Machinery	**124.5**	**124.5**	**126.5**	
Fabricated Metal Products	**128.2**	**128.2**	**126.7**	

(*) Estimated (p) preliminary (r) revised

US economy is on an upswing—personal incomes, factory workers' wages, new orders, manufacturers' shipments are all up.

Lone exception is farm income. Farmers' prices are considerably below last year's, resulting in a drop in income that is being felt by some farm equipment manufacturers, whose new orders have been declining sharply.

• • •

Personal income was at a $279-billion-rate in December, $3 billion higher than November, $15.5 billion over December 1951.

Factory workers' wages reached an all-time high in December—about $5 a week above those of a year ago, $1.60 higher than November's.

• • •

Manufacturers' shipments were up 3% in December over November for a total of $24.2 billion for the month. Durable goods shipments gained 2% over November, non-durable shipments gained 4%.

December new orders rose 2% over the previous month. Bulk of gain was in non-durables, which topped their November orders by 5%. Durable orders declined slightly.

Fewer December orders than shipments resulted in a decline of $1.6 billion in unfilled orders. Most of the drop was in back orders for durable goods—a $1.3 billion dip.

Manufacturers' inventories stayed level through November and December. Increase of $300 million in durable goods stocks was offset by a decline in non-durable inventories.

• • •

Manufacturing work week is at postwar peak. December's average of 41.8 hours was slightly longer than a year earlier. Greatest increase was in consumer goods firms.

• • •

Exports topped imports last year by $4.5 billion. Many foreign countries clamped restrictions on US imports last year, will bar more in '53.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-25 = 100)*	257.4	256.4	236.4
Steel ingot production (thousand tons)	2,248	2,248	2,090
Electric power output (million Kilowatt hours)	8,147	8,129	7,440
Production of automobiles and trucks	148,911	146,809	111,821
Engineering construction awards (*Eng. News-Record*, millions)	$141.1	$267.8	$222.1

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	269	279	211
Vacuum cleaners sales (thousands of units)	249	254	230
Washers sales (thousands of units)	311	293	297
Household electric ranges sales (thousands of units)	87	75	73
Radio production (thousands of units)	1,325	924	978
Television production (thousands of units)	921	780	467
Gear sales index (1935-1939 = 100)	456.8	516.0	716.5
Foundry equipment new orders index (shipments, 1937-1939 = 100)	343.3	258.1	230.5

* Seasonally adjusted

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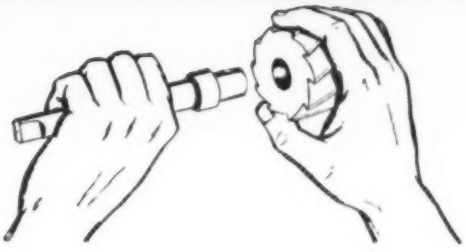

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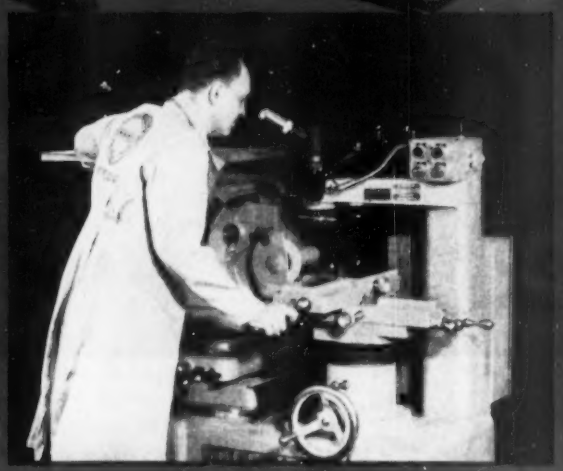

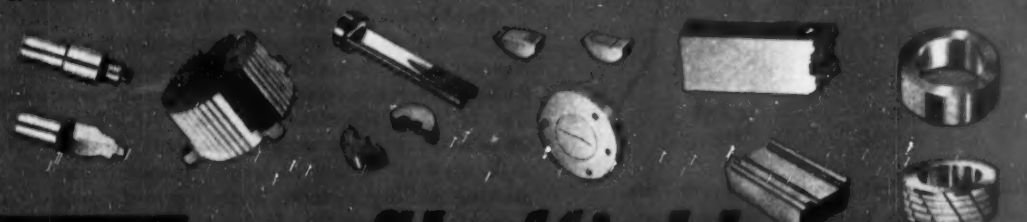

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Men and Automation

Men still are industry's most valuable asset. Sometimes we tend to forget that fact in the growing age of automation.

Automation has as its purpose the mechanization of production processes. Operations are done automatically instead of by human hand—faster, better and cheaper.

Perhaps it comes as a surprise that automation requires closer and more intelligent supervision of the manpower used than was necessary previously.

Take Ford. At its highly-automated engine plant it has 1 foreman for every 18 workers. The ratio for engine manufacture prior to automation was 1 to 31.

That is not all. The foreman now must know a lot more than he did before about the machinery and the processes under his care. He must know how it fits into the over-all production pattern.

The men under him, on the whole, are of better-than-average skill. Hence the foreman must possess better-than-average skill in dealing with them.

IN THE AUTOMATIC or semi-automatic factory few men are in evidence. That is misleading in judging the importance of the human factor.

The maintenance crew, in the background most of the time, is larger and more valuable than ever before. The emphasis is on keeping the automatic machinery running. It is devilishly expensive to have it down for repair.

Though one of the prime objectives in automating a plant or a department or several operations is to reduce direct labor costs—and that often is sufficient justification—indirect labor rises at the same time.

Automation takes the human drudgery out of metalworking manufacture. It does, among other things, the kind of job that no man wants to do. Don't forget that men no longer are willing to do many of the physically strenuous tasks that they did even as recently as 10 years ago.

THE POINT IS that automation admittedly reduces the number of men required to produce goods, but behind the scenes men still are needed, from the supervision level on down.

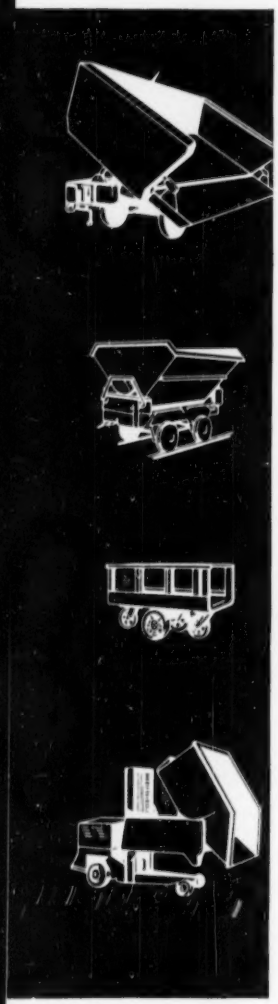
Those men are doing a higher type of work, on the average, than they formerly did. And their productivity is tremendously enhanced by the mechanical horsepower at their disposal.

Don't be misled by the popular idea that, with the advent of automation, men no longer will matter.

Without them and their direction, automation could not exist. They still are the key to production and, as far as one can see ahead, always will be.

Burnham Finney

EASTON simplified production and improved product with this CINCINNATI Press Brake



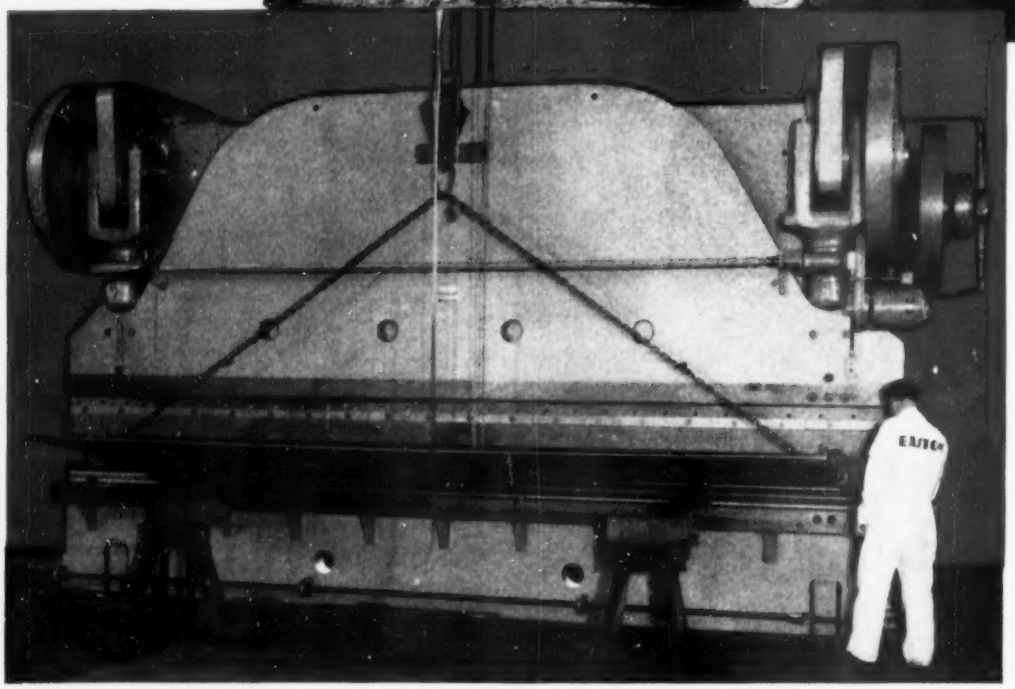


Illustration courtesy Easton Car & Construction Company, Easton, Pennsylvania.

Here a Cincinnati Press Brake is forming ½" plate for wide sections of off-highway trailers, at the Easton Car & Construction Company, makers of a large line of products for industrial transportation.

By using this Cincinnati Press Brake, some welding operations were eliminated, which improved the product, and reduced production costs at the same time.

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SPIN POLISHING — Hair-dressing domes is typical application of "off-hand" abrasive-belt contour grinding

ABRASIVE BELTS SPEED PRODUCTION

Contour Polishing and Grinding...I

BY DIRCK OLTON
Product Engineering Dept.
Behr-Manning Corp, Troy, NY

Recent developments in abrasive belts and belt grinders have brought this metalworking technique to the fore in production of contours. Here, in the first of a series of articles, Mr Olton describes production applications of offhand abrasive-belt contour grinding. Other articles will cover semi-automatic and fully automatic setups

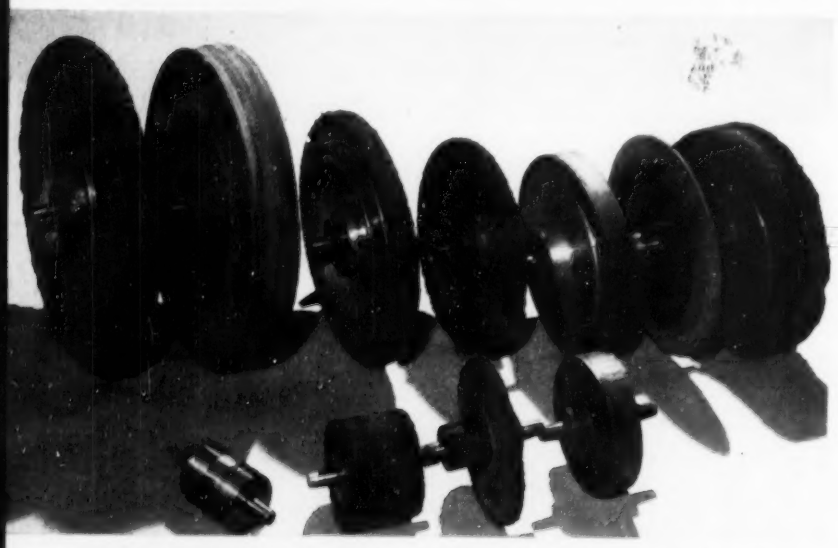
A few years ago, the use of coated abrasive belts in the polishing industry was a startling new manufacturing process. Today, there are very few plants that do not use coated abrasive belts in the polishing room. The changeover from "setup" wheels to coated abrasive belts was rapid when manufacturers realized the advantages of evenly-coated belts that provided finishes free of "wild grain" marks; the tremendously reduced inventory of wheels; the reduction in the number of polishing operations; the larger, hence cooler, abrasive surface available. In addition there is the elimination of expensive temperature-controlled "setup" rooms with skilled labor required for the care, operation, and upkeep of the "setup" wheels, glue, and grain. This rapid changeover from "setup" wheels to coated abrasive belts has been greatly accelerated with the recent development of resin-bonded coated abrasive belts.

At first, the use of coated abrasive belts was limited to straight-faced wheel operations, but with the advent of resin-bonded coated abrasive belts, extremely flexible belts, belts with greatly improved joints, and new coated-abrasive machinery; many contour operations formerly limited to formed wheels are being done by coated belts.

Three Basic Methods

Basically, there are three phases of contour belt polishing: off-hand polishing in which the work is entirely handled by a skilled operator; semi-automatic polishing where the operator feeds the work into the coated abrasive belts by using some mechanical advantage; and automatic polishing that is

PRODUCTION-LINE SETUPS are common in abrasive-belt operations. Here, auto grilles are rough ground and polished prior to plating. This is all off-hand work for finish rather than dimension



CONTACT WHEELS ARE IMPORTANT in off-hand belt grinding. Various types are employed for different applications. Included here are compressed canvas, felt, steel, rubber, and muslin wheels

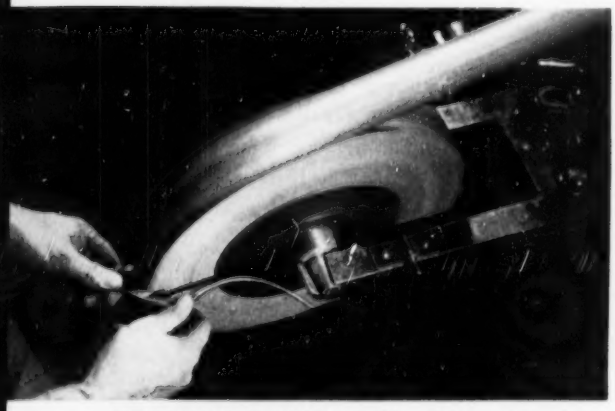
mechanically processed entirely except for an operator loading a station on a continuous rotary or straight-line polishing machine. Offhand contour belt polishing can be divided into several specific types, descriptions of which follow.

Formed Contact-Wheel Polishing

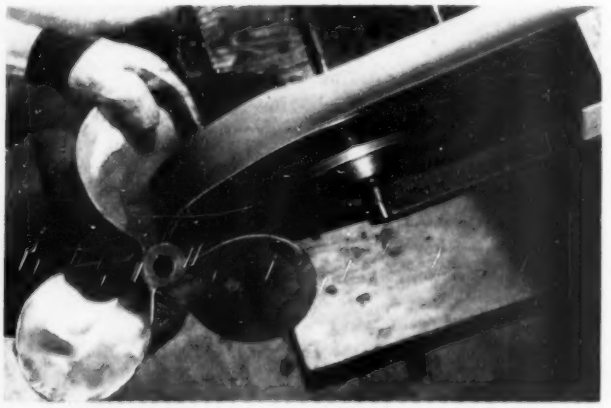
Simple contour-belt polishing with formed contact wheels is generally accomplished on two-spindle polishing jacks with backstand idlers mounted to the rear of the polishing jack. The backstands provide tension on the belts by means of springs or air cylinders, and they also track the belts accurately over the contact wheel. Generally these polishing jacks are powered with 5- or 7½-hp motors with belt speeds of 5000 to 7500 sfpm.

Deep Contour Machines

For deep contours, a machine such as the Bader polisher is used. On this machine, the contact wheel is an idler mounted on a yoke in front of the machine and uniform belt tension is maintained by a screw-actuated idler wheel mounted over the drive pulley. Because of lower belt speeds and uniform tension resulting from the belt being pulled over the idler contact wheel, it is possible to use radically formed wheels. Hence, we find this machine ably polishing formed workpieces of such complicated shapes as surgical instruments, scissors, shears, jet blades, plumbing fixtures, cutlery, and propellers.



FORMED CONTACT WHEELS simplify polishing of complex shapes. A convex wheel is employed here in finishing the handle of a surgical instrument where it joins the shank



DEEP CONTOURS are easily polished by the off-hand abrasive-belt method. This marine propeller blade is being finished on a Bader machine with a formed contact wheel

Narrow belts from ½ to 3 in. in width can be readily used on the Bader polisher, which drives the abrasive belt with a 2 hp motor and at a belt speed of 4600 sfpm.

Precision polishing is easily accomplished on the Bader polisher because the operator can sit, rest his elbows on his thighs, and steady the work into the formed abrasive belt operating over the contoured contact wheel. The direction of the belt can also be reversed, hence, work is often done on the top of the wheel. The contact wheel being an idler, wheel from 3 to 18 in. can be interchanged with no change in the peripheral speed of the belts.

In the off-hand formed-contact wheel method of abrasive-belt polishing, bias buffed wheels, compressed canvas wheels and muslin polishing wheels made from spirally sewn buff sections are used most widely. Formed rubber and felt wheels are generally reserved for specific operations.

For heavy roughing operations, the three-wheel vertical type of contour grinder is often employed. Coated abrasive belts up to 10 in. in width with motors of 5 to 10 hp are used for heavy stock removal, with the belt moving over the center contoured idler contact wheel at speeds of 5000 to 7500 sfpm.

Belt Strapping

Polishing inside the rings of such parts as scissors, shears, and hemostats has always been a time-consuming and costly operation known generally in the trade as "strapping." For this work, a coated abrasive belt is driven by a flanged pulley at the comparatively low belt speeds of 1500 to 2500 sfpm over an idler wheel. The idler maintains belt tension with the aid of a "heavy foot," spring tension, or a spring and ratchet. The operator releases tension on the belt, removes it from the idler and, not being under tension, it slips on to the rotating drive pulley. He then threads it through the ring of the piece, replaces the belt on the idler pulley, applies pressure to provide tension, and then polishes the ring by turning the piece in a 120° arc in the vertical plane.

A modification of "strapping" is used in polishing the slots in parachute buckles. The belt runs over a "finger" and the buckle is moved in a 30° arc in the vertical plane then blending the radii of the slot.

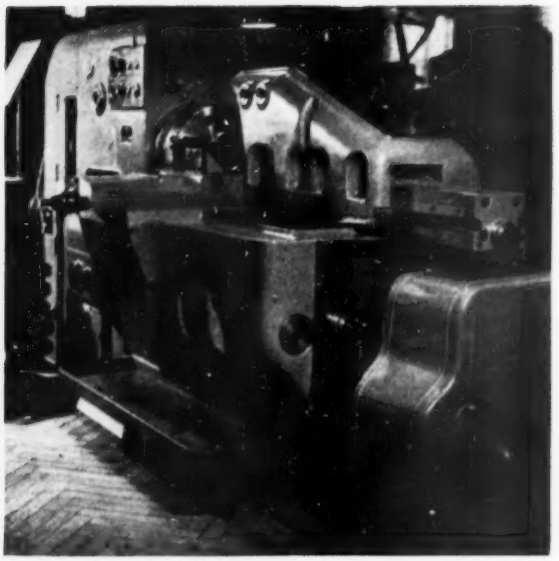
Additional applications of off-hand belt polishing will be described in the second article of this series.

HEAVY CONTOUR GRINDING is done by forcing the work and thus the belt, against the shaped contact wheel. Abrasive-belt machines for this work employ 5- to 10-hp motors

MODIFIED FORM OF "STRAPPING" polishes contours of parachute buckles. Belt runs over a "finger" while buckle is moved in arc

BELT "STRAPPING" is employed to finish inside contour of scissor rings. Belt is removed from idler wheel and fed through ring then returned to wheel for driving to remove burrs and polish

ELECTROLYTIC CARBIDE TOOL GRINDER has cast-iron or steel wheel as cathode, tool as anode, immersed in suitable electrolyte. DC passed through this circuit causes a thin film of carbide to be removed by electro-chemical action. The method eliminates special grinding wheels and final lapping, and risk of cracks or local deformation of the tip. Wheel is 3 5/16 in. in dia, runs at 1280, 1600, or 2000 rpm. Tools 1 3/16 × 1¾ × 12¼ in. long can be handled. Center height is 7 in., cross traverse of wheel is 3⅜ in., and longitudinal movement of 17¾ × 6¼-in. table is 9¾ in. Working mechanism is fully enclosed, and pushbutton controls are grouped



SEMI-AUTOMATIC CHUCKING LATHE specially designed for internal and external machining of bearing races 5½ to 9⅝ in. in dia. Longitudinal and boring slides have 77 feeds from 0.0016 to 0.062 ipr. and maximum longitudinal movement of 8⅝ in. Cross-slide traverse is 15/16 in. Twelve spindle speeds range from 52 to 400 rpm. All moving parts except cross-slide are pressure lubricated, and pump and rapid traverse have individual motors

Russia builds high-production machine

Here's dramatic proof that Russia is well abreast of modern trends in machine design and has the ability to build high-precision, high-output equipment. Pictures and details were supplied by a special correspondent

Automatic and single purpose machines are becoming predominant among the newer Russian models. This is a logical development of a policy which combines a limited range of products with a high degree of standardization and mass production in Metalworking.

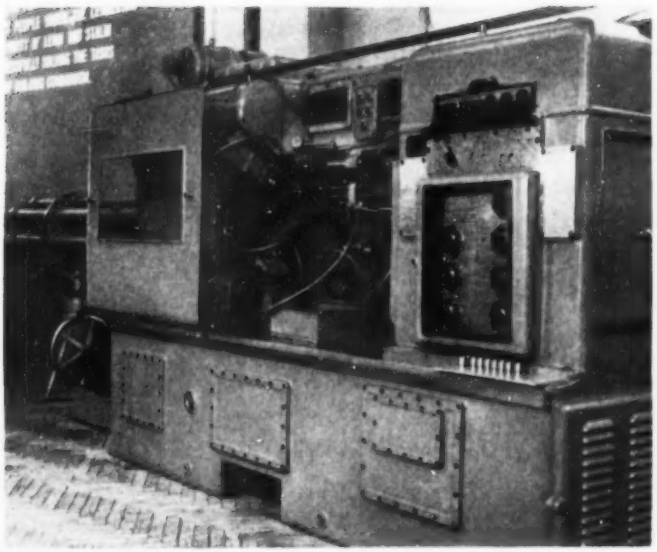
The number of bar and chucking automatics has increased considerably in the past few years, and now includes a variety of 4- and 6-spindle machines of each type. Several vertical chucking automatics are also being made, including a 15-in. 6-spindle and an 8-in. 8-spindle machine. In the single-spindle automatics there is one ½-in. bar machine with spindle speeds up to 7670 rpm.

In addition to standard surface and cylindrical grinders, Russia now makes a number of more specialized and high-output types. These include internal and external centerless, optical, profile, thread, double-spindle disk, electrolytic tool, and rack profile gear grinders. Electronic control is coming into wider use and is incorporated into profile and contour milling machines and high-speed lathes. One toolroom lathe has automatic spindle-speed correction to maintain constant cutting speed.

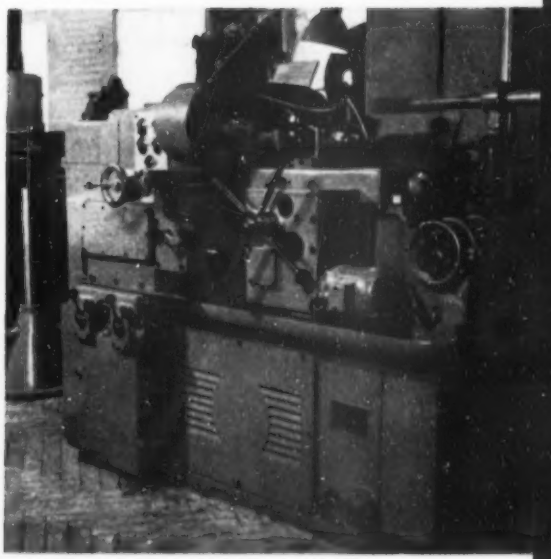
Other machines listed by the Russians as being in production are duplex, vertical-spindle, continuous millers; an 8⅝-in. pipe threading machine, cutting taper threads; a 6-spindle nut tapper; thread rollers; and a 4-head plano-miller with a 35 × 118-in. table.

There are now reports of a transfer line for manufacturing pistons. Automatic processes are said to include casting, heat-treating, machining, drilling, grooving, quality inspection (with reject), greasing, and packing. There is one central control panel for the entire machine and it is said to be operated by only four men.

According to Soviet publications, a great deal of emphasis is being placed on high cutting speeds, and there have been claims of over 8200 fpm being consistently achieved on steel by "stakhanovites."



SIX-SPINDLE BAR AUTOMATIC has 3 11/32-in. capacity, and feed stroke up to 7 9/32 in. There are four cross and one auxiliary slides, and hydraulic feeds are preset by "dialomatic" dials. Main tool block has feeds strokes from 0 to 7 9/32 in., cross-slides, 3 15/16 in. Stepless spindle speeds are from 127 to 1200 rpm. During indexing, spindle drum is raised hydraulically to reduce wear. Push-button controls are duplicated on each side of machine. Drive is from 25-hp, 1000-rpm motor



SINGLE-SPINDLE AUTOMATIC has six-position horizontal turret and one cross-slide, and takes ¾-in. bars. Bar feed length is 3 15/16 in., turret slide traverse 8¼ in., cross-slide travel 4½ in. Spindle speeds (to 6000 rpm) and turret feeds for each position are pre-selected by electromagnetic clutch shown at right. There are three feeds for the turret and cross-slide, 0.002 to 0.008 and 0.001 to 0.004 ipr respectively. A larger version of this machine has a 1-in. capacity and 6-in. turning length

tools

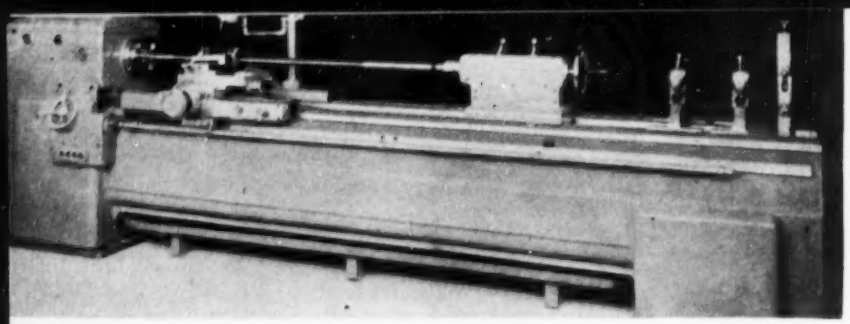
Carbide-tipped tools seem to be widely used to step up output and reduce production times. One Russian catalog on sintered carbides, covering "standard tips," describes and illustrates gear hobs, keyway broaches, milling cutters, die blanks, and counterbores. The wider use of ceramic-tipped tools is also reported, together with the claim that they have made it possible to double the normal cutting speeds on steel, and to increase the rate on cast iron from two to four times.

The machines shown have actually been produced but there is no information as to the production rate.

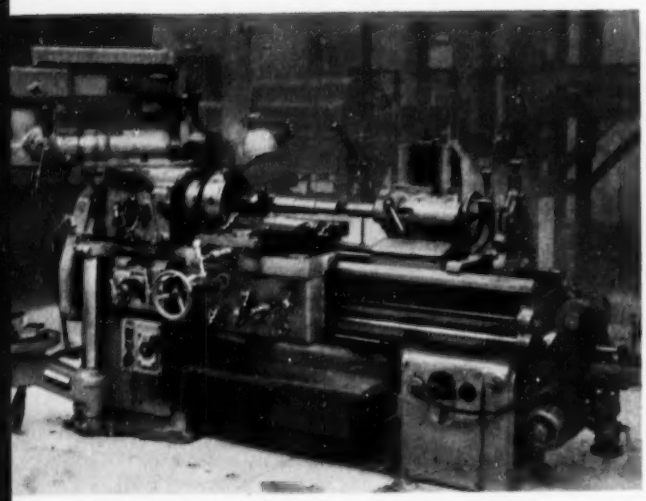
PLEASE TURN PAGE . . .

UNIVERSAL COPY TURNING and threading lathe has 15¾-in. swing over bed, 39 in. between centers. Screwcutting range is from 2 to 30 tpi; 1 to 15 mm, 16 to 240 mm metric; 0.25 to 3.75, 4 to 60 module; single or multi-start, parallel or tapered. Stepless speeds from 18 to 3000 rpm are pushbutton controlled Longitudinal feeds are from 0.002 to 0.039, cross-feeds from 0.001 to 0.002 ipr. Rapid traverses are 142 and 71 fpm respectively. Copy turning is by electric tracer

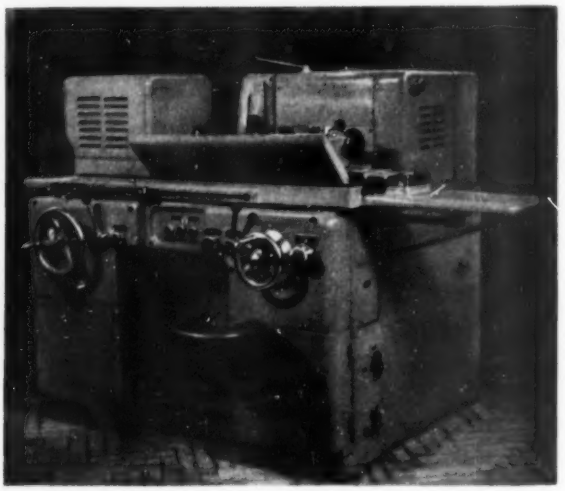
SINGLE-SPINDLE AUTOMATIC screw machine with 13/32-in. chuck capacity and hexagonal vertical turret. Maximum bar feed is 3½ in.; stepless speeds are from 100 to 2000 rpm. Drive is by 6¾-hp, dc motor, with spindle speed and direction of rotation preset for each turret position. Vertical slide and two cross-slides have maximum traverse of 1½ in., and 5½-in. dia turret has 3-in. travel. Back shaft (operating feed, chucking and turret indexing) and cutting oil pump are driven by separate motor. Attachments are available



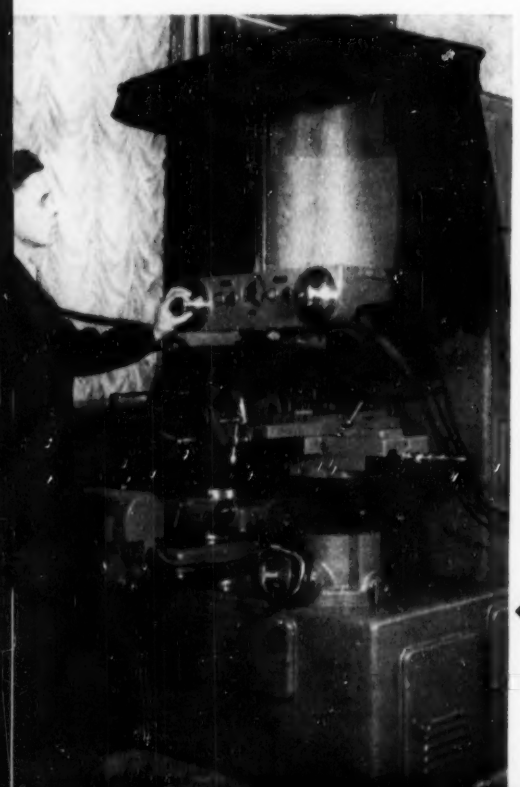
LEADSCREW LATHE takes 98½ in. between centers. Drive is from 4-hp, 2-speed motor with 9-step gear change and V-belts. Speeds are from 7.5 to 65 rpm forward and 15 to 150 rpm reverse. Threads ⅛- to ½-in. pitch may be cut on work ¾ to 3 in. in dia. Leadscrew errors are compensated by a correctional cam. Cutting fluid pump has ¼-hp motor

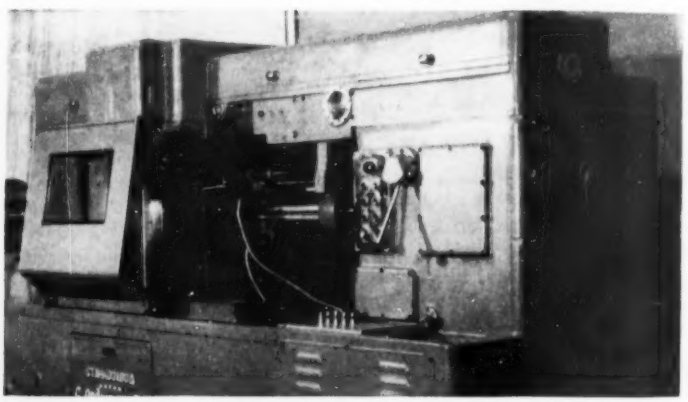


COMBINATION UNIT for small shop, shipboard, or mobile use comprises lathe, horizontal miller, drill, vertical miller, tool grinder, slotter, and external and internal grinder. Lathe takes 39 in. between centers, has 25½-in. swing, spindle speeds from 23 to 1000 rpm, screwcutting range 3 to 28 tpi, milling table is 27½ × 11 13/16. Vertical drill has 1-in. spindle with speeds of 62 to 1118 rpm. Tool-grinding attachment (extreme right) has 4-in. wheel running at 5600 rpm. Maximum slotter stroke is 4 in. Main grinding wheel is 6 in. in dia, operates at 3500 or 5700 rpm. Total power consumption is 6 hp, weight 3800 lb



PRECISION CYLINDRICAL GRINDER takes 19 in. between centers and maximum work dia of 5 in. Workhead is driven by dc motor with stepless electronic control from 100 to 1000 rpm. Longitudinal traverse is 23 in., hydraulically operated at 0.008 to 0.25 ipm with automatic cycle, or 17/32 in. per turn of handwheel. Speeds of the 15¾-in.-dia wheel are 1800 and 2200 rpm, feeds 0.0001 to 0.0010 in. per reversal





HIGH OUTPUT is claimed for this 4-spindle, 1½-in. bar automatic designed for carbide tooling. Spindle speeds are from 158 to 2170 rpm in 24 steps. Maximum turning length is 7¾ in., with feed strokes ⅜ to 3 in., idle to 4¾ in. Four cam-operated cross-slides have idle and feed strokes of 3¾ to 4⅝ in., and 0 to 4⅛ in. respectively. Longitudinal slides are independent of each other and have manual adjustments. Machine is also made with six spindles and six cross-slides. They have electrical interlocks and automatic lubrication, and are powered by a 27-hp motor

OPTICAL PROFILE GRINDER has a projection screen showing a 50 times magnified image. Further data are not available, but the control panel looks interesting.

How to cut your fork-truck costs

BY O T HENKLE, JR
THE MERCURY MANUFACTURING CO
CHICAGO, ILL

The human element is one of the greatest factors in the cost of fork-truck operations. Everything has been engineered into a truck with the exception of the skill and expertness of those responsible for the truck's continued high-level productiveness. Thus, operator judgment becomes as important as good truck design, material, and workmanship.

In some ways, operator judgment is more important, because lack of proper judgment can result in considerable property damage, severe injuries, or even loss of life. It must be remembered that tons of material, possessing an enormous amount of kinetic energy are being handled whenever the truck is in operation. This force must be carefully controlled if operating and maintenance costs are to be kept at a minimum. Certain rules, when tailored to your individual requirements, will guide the operator to these objectives.

Proper Use of Equipment

The primary rule is to permit only qualified operators to drive the truck. Whenever the truck is left idle, the key should be removed. This will render the truck inoperative and prevent unauthorized use.

Reverse gear should not be used as a substitute for brakes, because this imposes severe strains upon the drive. If brakes are faulty, this should be reported to the maintenance department so repairs can be made immediately.

It should be the operator's responsibility to see that each unit-load is securely piled before attempting to move it. The operator then should drive the truck under the pallet as far as possible, locating the forks centrally under the load. Off-center loads reduce the stability of the truck and exert unnecessary strain on parts of the lifting mechanism.

The Importance of Loading

Equal in importance to its location, is the amount of the load. The operator should take care not to exceed the maximum safe-loading capacity of his truck. When carrying loads near this limit, or at high-lift on telescopic trucks, extreme care should be taken in maneuvering. Only first or second speed should be used and the floor should be smooth and level.

When loading into highway trucks or trailers, be sure that the brakes on the receiving unit are set and the wheels blocked. If the springs are weak, the body should be supported with jacks or braces. Also, inspect all car, truck, and trailer floors carefully before entering. Be certain that the floors are strong enough to support the combined weight of the fork truck and load.

When starting with a load, all speeds should be used. The controller handle should not be thrown into top speed immediately. When stopping, however, the controller should be returned quickly to neutral to avoid dangerous arcing. The truck should not be driven in an unsafe condition. Any mechanical or electrical deficiency should be reported immediately. This not only reduces hazard and often prevents small repairs from becoming major expenses.

Care must be taken to prevent the loaded truck from passing over chips, oil, materials in process, or other obstructions. Dirty floors should be reported to those responsible. Aisles should be marked with contrasting stripes and kept clear at all times. Care should be taken to prevent bumping into objects. This is especially so when backing or turning. During travel, tracks should be crossed on a diagonal and the operator should keep a firm grip on the steering control. When approaching elevators or traveling on downgrades, truck speed should be reduced.

When approaching or passing noisy machines, extra operator care is required to avoid distraction. The horn should be used only when required but the operator should be certain that his warning is sensed.

The load should be carried as close to the ground as possible to insure stability over rough roads and while making turns. When carrying loads at high-lift on telescopic fork-truck models, it is necessary to watch overhead obstructions and be certain that sufficient clearance is available.

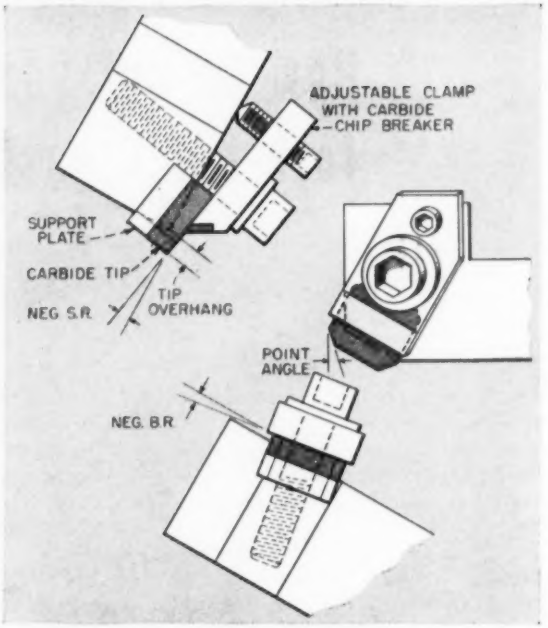
General Safety Precautions

Operator safety is most often dictated by common sense. Some of the more common violations are cited here to accentuate the seeming unimportance of conditions which may result in accidents. When the truck obstructs the operator's view, the truck should be run in reverse.

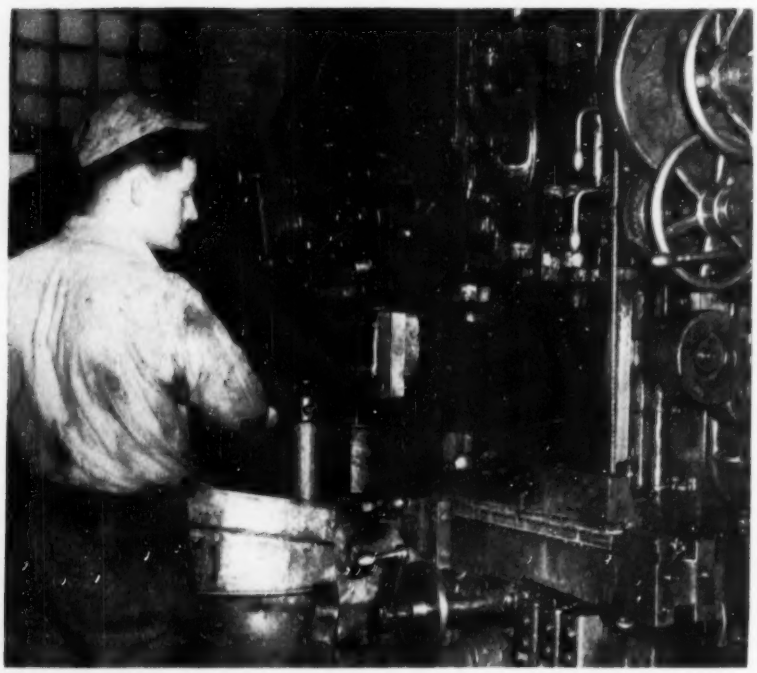
The operator should never drive with wet or greasy hands. Also, no riders ever should be permitted on a truck. The operator should keep all parts of his body within the truck and should never maneuver too close to pedestrians or trucks.

INGENIOUS HOLDER INCREASES LIFE OF CARBIDE TOOLS

Newly developed mechanical holder avoids breakage of carbide tips, eliminates damage to the holder itself and does away with resetting of tools after grinding, reduces strain on machines in heavy cuts . . . Here's how production on a tough machining job was increased 40%, tool costs cut 75%



MECHANICAL HOLDER has seat for square carbide blanks milled to any desired rake angle. Carbide and copper-plated, hardened tool-steel shims are held in position by pressure of socket head cap screw on clamp. Screw in rear permits adjustment in height of clamp when carbide is ground—also prevents turning of carbide with cutting force



INGENIOUS SETUP for machining inner faces for railroad bearings has arbor with tapered cones that expand to actuate three holding pins against bore of eccentric work. Top surface is faced and chamfered while OD is turned so that chucking on the OD or clamping at the top is impractical

BY GEORGE H DeGROAT
ASSOCIATE EDITOR

Roller bearings for railroad-car journal boxes create a production problem in machining SAE 4320 bearing steel. Extruded inner races for these bearings are 11 in. long and 8¼-in. OD, finished. Brazed carbide - tipped tools snapped like matchsticks in removing ⅜ in. from the rough OD, ½ in. from one end. Besides the obvious high cost of tool replacement, broken pieces of carbide buried in the expensive, partially machined cylinders made a tough salvage problem tougher.

In an interview with Leo J St Clair, cutting-tool consultant of East Orange, NJ, and Morris Thompson, owner of TCM Manufacturing Co, Harrison, N J, we learned how a new holder for square carbide tips changed this job from a headache into a profitable routine production run. Carbide is Carboloy grade 78B ¾ in. square by 3/16 in. thick, run at an average feed of 0.023 ipr in a

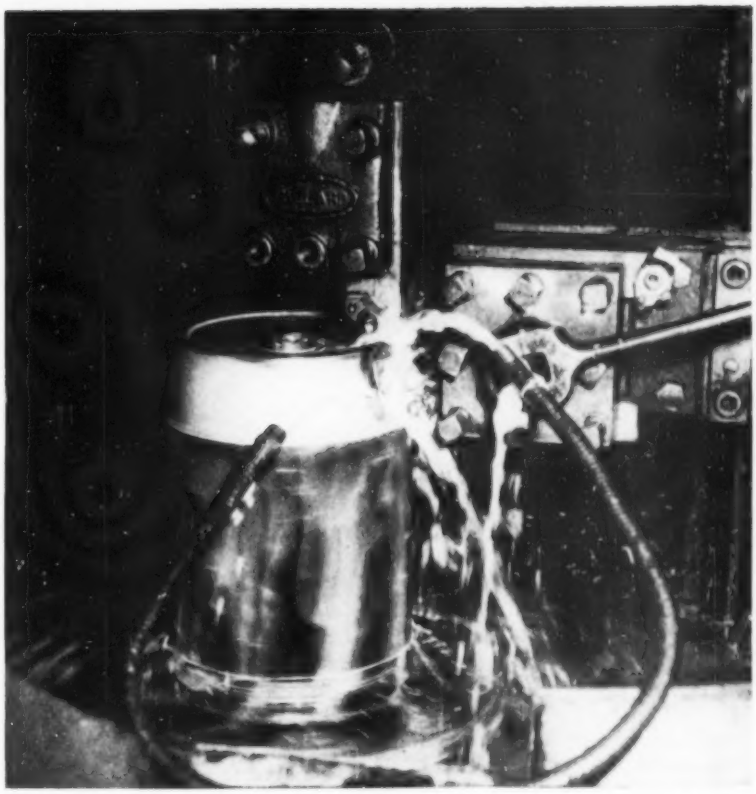
Bullard vertical turret lathe, using a cutting speed of 466 sfm and a water-soluble coolant.

Tips have 45° point angles at each corner instead of nose radii—produced by grinding a $^1/_8$-in. flat adjoining the side and end cutting edges instead of grinding a curve. The point angle, like a nose radius, decreases chip thickness at and near the finishing end, however, the point angle keeps thin chips uniform in thickness, therefore it withstands more severe cutting forces, causes less possibility of setting up chatter than does a nose radius and as a result, produces longer tool life.

Copper Cushion

The toolholder has a seat milled to the desired rake angles—7° negative back and side rake in this case—and the tip is locked in place over a $^1/_4$-in. thick, hardened, copper-plated tool steel shim or backup piece. This backup piece is hardened for rigidity to provide adequate support of the carbide under cutting loads. Copper plating gives it resiliency or cushioning and provides intimate contact between the surface irregularities of the milled seat and the shim at the bottom surface and at the top surface large-area contact with the carbide. Result is a double cushion, a high degree of flatness and good heat-tranfer properties. In this setup, the carbide overhangs the holder about 3/16 in., thus meeting one of the big problems on this job—that of keeping broken bits of carbide from becoming imbedded in the work and preventing damage to the holder when breakage occurs. When one of these tools breaks, the carbide falls free instead of being jammed into the surface being machined as with conventional brazed tools.

The turning tool is set at a 30° angle in the horizontal head and a facing tool is set at 45° in the vertical head for facing the end and chamfering the ID of the sleeves. Usually two tools are set up in each head to permit continuous production while changing worn tool edges. Less than a minute is required for such changes—because it is only necessary to index the tool tip 90° to bring a new cutting edge into action. This is done about twice a day—for every 25 completed pieces—to eliminate straining the machine as the result of tool wear. Maximum permissible wear land is 1/32 in. By turning the tool tips over, a total of eight cutting edges are available so that each tip theoretically should last four days. Actually, however, heavy, uneven loads set up severe strains that at times cause them to break after five or six edges have been used. Clamping action of the holder is so good, though, that broken pieces are being used. Because the tips are all ground uniformly square and to size and because the toolholders control exact angles and are never removed from the machine during change of the cutting edge, no resetting is ever needed after changing cutting edges. The term "edge changing" is therefore used here rather than "tool changing."



HEAVY CUTS ON TOUGH MATERIAL, SAE 4320 bearing steel—Bhn 180— are made without breaking carbide that overhangs holder by 3/16 in. New mechanical holder provides double negative rake—breaks chips into tight uniform curls that are easy to remove from machine. Horizontal head is set up with two tools to permit changing without interrupting production. Less than one minute is required for tool changes

One of the big advantages of this tool is the manner in which it breaks up chips into tight, compact, curls instead of long strings that previously presented a removal problem. Over 100 additional pounds of scrap per barrel of chips is accumulated as a result. Cleaning the machine is reduced from ¾ hour, three times a day, to a few minutes once a day.

Other advantages gained include elimination of diamond-wheel grinding of carbide because all angles are produced in the holder, the carbide being flat-ground with silicon-carbide wheels. No brazing time is expended, and, of course, stresses set up on carbide as the result of brazing are eliminated. An average rate of seven pieces per hour are produced, with no rejects as compared with the previous production rate of 5 pieces per hour, 10% of which required salvaging.

faster assembly...

cleaner joints...

multiple operations...

reduced waste...

simplified design when...

BRAZING ALLOY IS

PRACTICALLY any ferrous or non-ferrous metal strip is now available for manufacturing uses clad with a predetermined thickness of silver brazing alloy on one or both sides. This material is not new. It has been used by jewelers for years. We call it "Braze-Clad." Other manufacturers use other names. Although jewelers are thoroughly familiar with its use, Metalworking has largely overlooked its many advantages.

Brazing alloy is pre-diffused into the surface of the base metal by applying heat and pressure. Then, the composite bar is rolled to the required thinness and slit to the proper width.

Almost any commercial or government specification brazing alloy is available, clad to low-carbon steel, copper, various brasses, phosphor bronze, beryllium copper, invar, stainless steel, monel, nickel, nickel silver, precious metals and special alloys. In fact, any combination of brazing alloy and base metal is possible providing the melting range of the alloy is above the annealing temperature of the base metal.

Also, special Braze-Clad shims are available for brazing carbide tips to toolbits. These shims provide silver brazing alloy clad to both sides of a base (cushion) of copper, constantin, or nickel. Use of these shims simplifies mounting the tips, reduces the danger of overheating, and improves joint strength. When silver brazing alloys are pre-bonded to the base metal, the metal anchors the brazing alloy in place during the entire heating cycle. Thus, the alloy is evenly distributed; there are no voids or oxide islands and the danger of tips coming loose in operation is minimized.

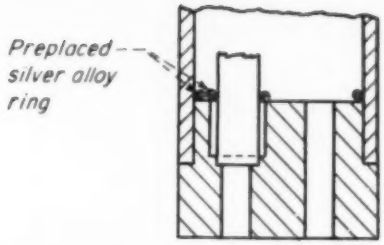
Clad alloy for product assembly is used in two ways:

1. As a brazing shim, where absolute control of the flow of brazing alloy is mandatory, and where joints must be perfect and free of voids.

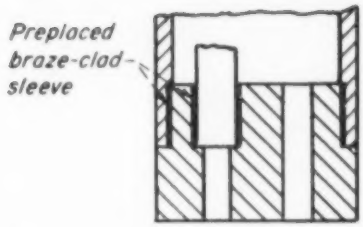
2. As a custom-clad strip stock from which entire parts are stamped and formed, having one, or both, of their surfaces completely covered with silver brazing alloy. Thus, the alloy is automatically preplaced so that blind joints and joints of large area are readily formed. In addition, clad strip stock permits the simultaneous joining of several components,

FOUR TYPICAL APPLICATIONS of this useful material include the pressure-tight joint for a welding torch, a blind joint in a reinforced hollow blade, a shim for brazing carbide tool tips, and the multiple joints in an electronic tube assembly. Joints are positive and weight is usually reduced

WELDING TORCH



SILVER BRAZING ALLOY IS BONDED by heat and pressure (clad) to any ferrous or non-ferrous base. Thus, parts can be joined by a brazing shim or by making them directly from custom-clad strip stock



BLIND JOINT ASSEMBLY was made difficult, in conventional silver brazing, by eccentric position of innertube as nearly all of the brazing alloy flowed to the outside. With clad-alloy sleeves, both joints are consistently presure tight at 125 psi pressure. Original production was 2 pc per hr; is now 30 pc per hr and rejections are practically zero

CLAD TO STRIP

BY JOHN P EMMERICH, Field Engineer
AMERICAN SILVER COMPANY INC, FLUSHING, N Y

as is often required in the electronics operations.

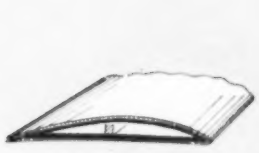
Pre-clad stock can be stamped or drawn to produce washers for butt-joints, shims for butt- and shear-joints, sleeves for tubes and sockets, irregular shapes for inserts, caps for closures, and many other forms to suit the components of an assembly.

Brazing-alloy and base-metal thicknesses can be varied to suit specific conditions and any silver-brazing alloy meeting the required flow range can be used. Oxyacetylene, acetylene-air, city gas-air, induction heating, salt bath, or furnace heating are all suitable for joining with pre-clad stock. Usually, heating method is selected to suit material used, thickness of the sections, and quantity of pieces.

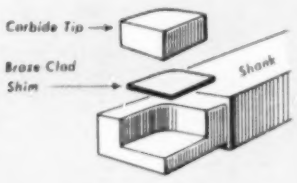
While the same general precautionary measure regarding the cleanliness of components must be observed as with plain silver-brazing alloys, the process of joining with pre-clad stock requires less operative skill and results in greater production at a lower manufacturing cost. The use of clad-all-over stock in areas that do not require brazing may seem a wasteful expenditure of silver. Actually, the silver is usually only 0.002 to 0.005 in. thick, there is no process waste, and assembly time is greatly reduced. The value of these factors far outweighs the cost of unbrazed silver, unless the part design is very poor. Sometimes, pre-clad stock will permit assemblies which cannot be accomplished by any other means. This material should, especially, be considered for joining stamped components with powder-metal components as there is less tendency for the powder part to draw an excess of silver into the pores.

In designing brazed assemblies, blind joints are a frequent and unavoidable problem. Here, the clad alloy does not require pre-placing nor is it necessary for the brazing action to "draw in" and distribute the silver.

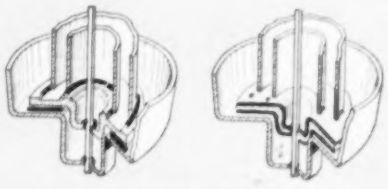
Brazing jigs and joint fits *must* be more accurate than for plain silver brazing. They cannot be "sloppy." This rule is necessary because there is no excess silver alloy to fill gaps and voids created between improperly postitioned components. However, this difficulty is counterbalanced to some extent by the simpler tooling needed with pre-clad stock; also by improved product quality.



HOLLOW BLADE

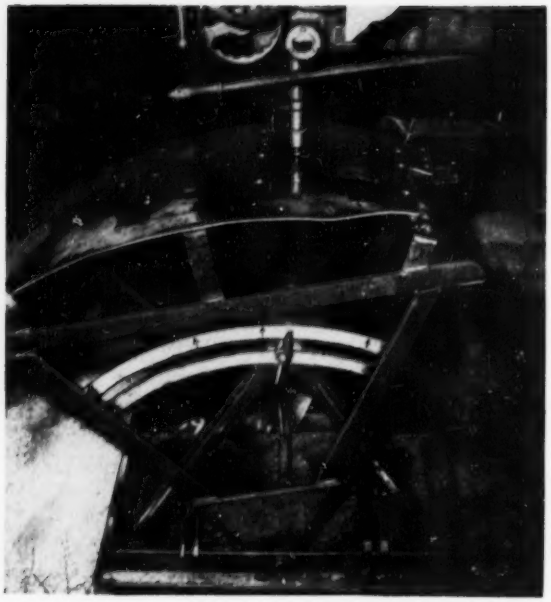


CARBIDE TIP

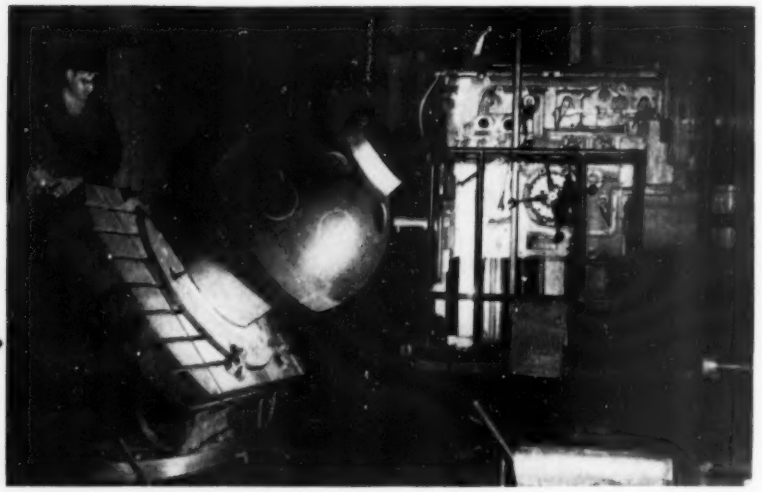


ELECTRONIC TUBE

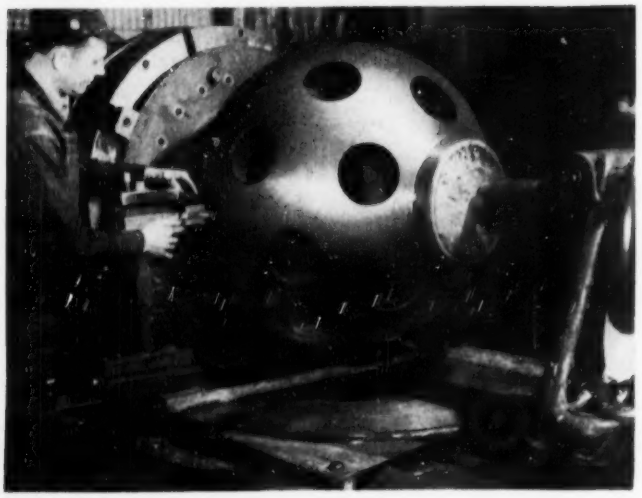
SHOP SHOTS



PIVOTING FIXTURE SPEEDS DRILLING of radial holes in curved steel plate. Hole pattern is punched on piece with layout templet. Piece then is located against stops on curved top of V-shaped frame. As frame is pivoted to position of each row of holes, arrow is scratched on whitewashed segment by which frame is clamped in position. Subsequent pieces are positioned quickly by matching arrow with point of frame support just above arrow. For different hole patterns, segment is given new coat of whitewash and arrows are established to suit. *Watertown Arsenal*

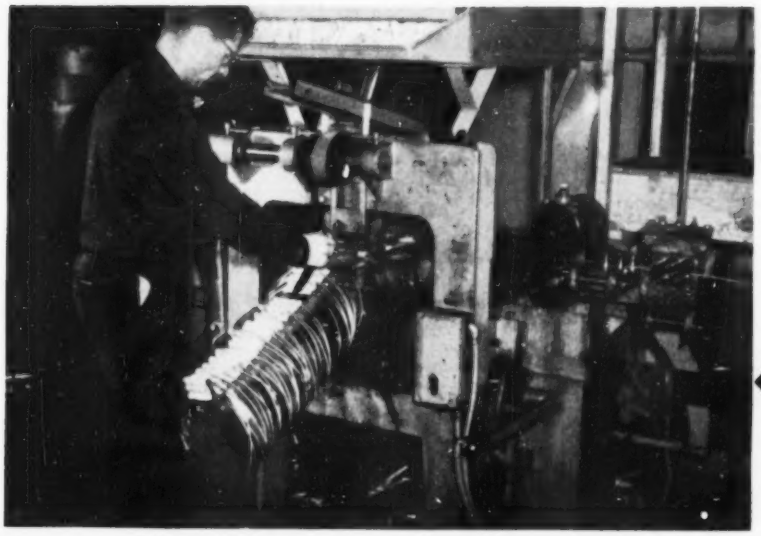


BORING one of fifteen 9-in.-dia holes in projector carrier for first full-scale planetarium instrument built in US is performed on adjustable-angle worktable. Projector contains some 25,000 mechanical elements, many machined to tenths, and 141 separate optical systems made up of 321 lenses. *Bethlehem Pacific Coast Steel Corp*



FINISH-MACHINING SURFACE of spherical star projector for planetarium instrument is performed with ball-turning attachment on 48-in. lathe. Surface is machined to fit circular ribbed plate. *Bethlehem Pacific Coast Steel Corp*

LIQUID RUBBER POURS INTO GROOVE of pail cover in semi-automatic operation. When operator kicks pedal, table rises to pouring position. Spring clamp grips piece, table starts spinning, and valve opens to pour measured amount of liquid. Rubber hardens to form soft sealing surface in rim of cover. *Rheem Mfg Co*



PAIL HANDLES ARE PRODUCED AUTOMATICALLY in two-position operation. Wooden handles feed by hopper to first position. Wire feeds through handle and is cut off. Assembly moves forward to second position, where wire is bent and ends are formed. Operation runs at 1800 pc per hr. *Rheem Mfg Co*

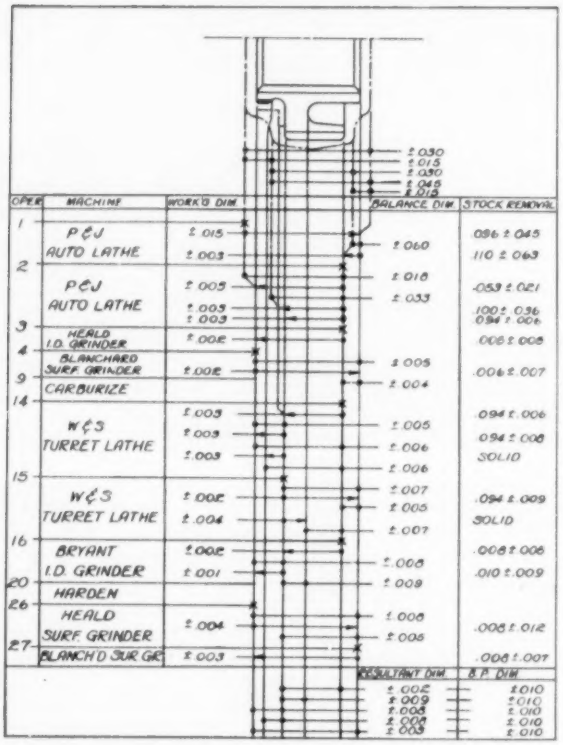
THERMIT WELDING JOB joins three-piece, 39½-ton, cast-steel frame for one of five C-4 Mariner ships to be built in Bethlehem Pacific's San Francisco yard. Mold box is built around joint, and sand mold is formed around wax pattern of intended weld. Pattern is melted out, mold is dried, and pieces are raised to temperature with gas torch for 14 hr. Completed weld can be seen to right of hub. Approximately 2350 lb of thermit are required. *Bethlehem Steel Corp*

Tolerance charts control production machining

Machining operations at Pratt & Whitney Aircraft are controlled by charts that show the amount of grinding stock to be left between one operation and another and the tolerances required to meet these and other needs. Here's how they work

By CHARLES J MARKS, Area Supervisor
Production Engineering Dept
PRATT & WHITNEY AIRCRAFT
East Hartford, Conn

TOLERANCE CHART (rough)



PRELIMINARY TOLERANCE CHART for gear production has a composite gear diagram, lists operations to be performed and machines used. Tolerances are applied at each step to determine practicability of the operations and locating surfaces as far as dimensions are concerned

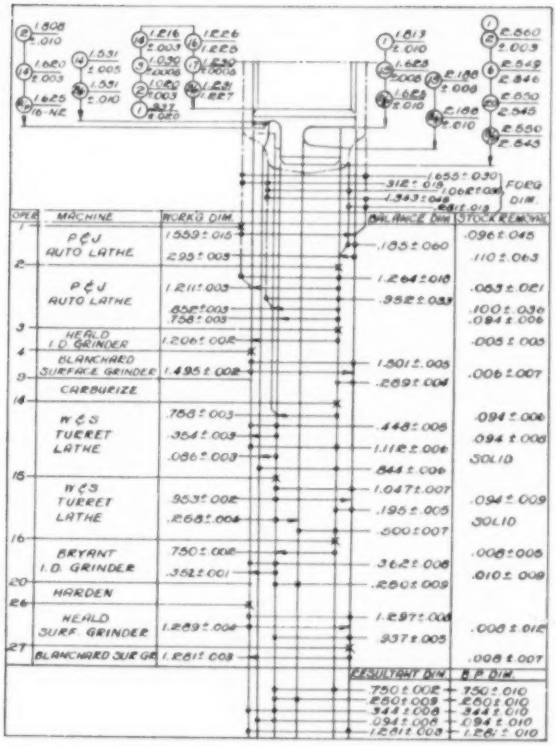
A tolerance chart is a graphic means of showing the dimensions of a part at all stages of manufacture. It shows the amount of stock to be removed on all cuts, and the final dimensions obtained as a result of dimensioning methods and the tolerances held on the preceding operations. At Pratt & Whitney Aircraft, East Hartford, Conn, tolerance charts are used extensively for dimensional control in the manufacture of precision gears for piston and jet engines.

The charts reduce the possibility of dimensional errors in processing these parts. Moreover, they prove that dimensions on the operation sheet will produce a gear in exact accordance with the part print. In addition, they prove the practicability of holding the dimensions specified by showing that sufficient stock can be removed to meet the required dimension even under adverse tolerance conditions. They not only save considerable time in making changes as compared with the involved checking of calculations required when tolerance charts are not used—but they provide a quick means of determining the feasibility of proposed changes in manufacturing methods or dimensioning.

Preparing a Tolerance Chart

The first step in dimensioning a gear under this system is to make a preliminary draft of a tolerance chart, to show the practicability of the operations and the locating surfaces from a dimensional standpoint. If the gear is made from a forging, the forging print dimensions and any "balance" dimensions required are shown above the column heading line. "Balance" dimensions result from machining operations and are measured from one machined surface to another easily measured surface. This shows how much material is left after a particular operation is finished. All operations that affect dimensioning are listed—including basic heat-treating such as stabilizing, carburizing, and hardening—to give a clear picture of the processing. Sufficient information about the machines and equipment used is supplied to identify them. Burring, cleaning, inspection, and other operations that do not affect dimensions are omitted. Generally, all dimensions given on the part print are shown with the exception of tooth data, concentricity notes, radial locations, and radii. Specifications of chamfers are optional, depending

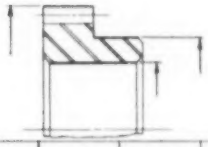
TOLERANCE CHART



TOLERANCE CHART IS COMPLETED by adding basic dimensions after satisfactory analysis of tolerances set up on preliminary draft. Chart now shows amount of stock to be removed at each operation and final dimensions obtained as a result of dimensioning methods and tolerances held

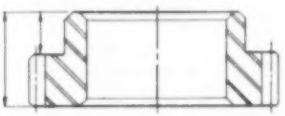
GRINDING STOCK ALLOWANCES

Diameter Chart



Diameter	Up to 2"	2" to 6"	6" to 12"	12" to 18"
Location grind before carburizing	.010	.012	.015	.018
Fin. grind carburized dia. after hardening	.010	.012	.015	.018
Fin. grind dia. not ground before hardening	.014	.017	.020	.022
Fin. grind for micro fin. or after nitriding	.004	.005	.007	.008

Face and Shoulder Chart



Dia. of Face	Up to 2" Min.	Max.	2" to 6" Min.	Max.	6" to 12" Min.	Max.	12" to 18" Min.	Max.
Location grind before carburizing	.004	-	.005	-	.006	-	.007	-
Fin. grind carburized surf. after hardening	.004	.008	.005	.008	.006	.010	.007	.010
Fin. grind surf. not ground before hardening	.006	-	.007	-	.008	-	.009	-
Fin. grind for micro fin. or after nitriding	.001	.003	.001	.003	.002	.004	.002	.004

GRINDING STOCK ALLOWANCES for diameters, shoulders, and faces of gears have been calculated to insure leaving sufficient stock after machining and to prevent removal of so much stock that hardness will drop below permissible limits. Data are tabulated for use in making up tolerance charts

on whether or not any difficulty in production is probable.

Line symbols indicate the locating surface of a part, show that the part is held on centers, indicate the surface from which the dimension is measured, and other similar information. For example, a line between two dimension lines with a large dot, or circle, at each end indicates balance or resultant dimensions. A similar line with the dot at one end and an arrow-head at the other shows the surface from which the dimension is measured, (dot end), and the surface being machined, (arrow-head end). Asterisks and notes are employed to explain conditions not covered by these symbols.

On the preliminary draft of the chart, tolerances are filled in on working balance, resultant and stock-removal dimensions. If at this point, tolerance accumulations exceed permissible limits, or if machining dimensions must be held too close to prevent accumulations, corrective steps are taken. These include changing location points, adding corrective operations, revising operations on the basic layout, deviating from stock allowance standards, re-dimensioning the operations or increasing tolerances on the part print by means of engineering changes. After the method and dimensioning have been proven satisfactory by reviewing the tolerances, the chart is completed by adding the basic dimensions.

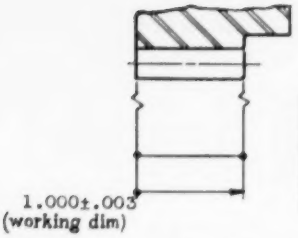
Stock Removal Dimensions

The basic stock to be removed from a face is a variable depending upon the tolerance on the working dimension under consideration and the preceding balance dimension. Stock-removal dimensions are calculated by taking the difference between the working dimension and the previous dimension between the same two surfaces and adding the tolerance on both. For example:

1.655 ± 0.030 *(previous dim.)*
1.559 ± 0.015 *(working dim.)*
0.096 ± 0.045 *stock to be removed*

Stock allowances for grinding have been set up to establish a general guide for this work. Two primary factors have been considered in deciding on these allowances—the necessity for a sufficient amount of stock to insure cleaning up the work and the need to remove a minimum amount of stock, (especially from AMS 6260 steel used for gears) to

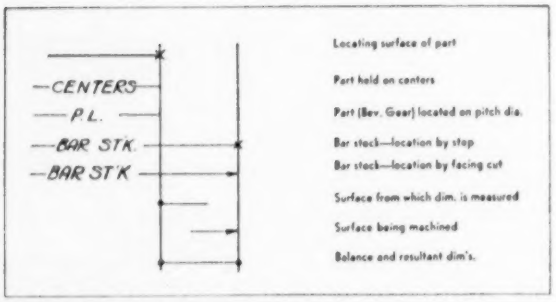
HOW TO FIGURE BASIC STOCK ALLOWANCES



Bal Dim	Stk Rem	Min	Max
1.005±.004	.005±.007	.004	.006

Example:
Take: ½ full tolerance of the balance dimension = .004
Subtract: ½ full tolerance of the work dimension = .003
.001
Add: Minimum constant from Grinding Stock Chart = .004
Basic stock allowance = .005

BASIC STOCK ALLOWANCES used in making tolerance charts are calculated by subtracting one-half the full tolerance of the working dimension from one-half the full tolerance of the balance dimension—the difference being added to the minimum constant shown on the grinding stock allowance chart



DIMENSIONAL LINE SYMBOLS indicate setup at each operation and type of dimension referred to on chart. Asterisks and notes are employed to explain conditions not covered by these symbols

prevent hardness dropping below permissible limits. Grinding stock allowances for diameters and shoulders of gears are charted for use with tolerance charts.

To find *basic* stock allowances for setting up a tolerance chart, one-half the full tolerance of the working dimension is subtracted from one-half the full tolerance of the balance dimension—the difference being added to a *minimum* constant taken from the grinding stock allowance chart. For example:

0.004 (½ full tolerance—balance dim)
−0.003 (½ full tolerance—work dim)
0.001
+0.004 (min constant from chart)
0.005 = Basic Stock Allowance

The tolerance chart is completed by adding this figure in the column headed Stock Removal. This formula is not employed when the tolerance on the balance dimension is less than the tolerance on the working dimension. In such cases, the minimum constant from the grinding stock allowance chart is used—because the basic stock dimension must never be less than the minimum constant.

On grinding operations the tolerance on the working dimension is often larger than the basic stock removal allowance. In such cases the minimum amount of stock that can be removed must be sufficient to insure cleaning up the surface. Also, if the surface is hard, the maximum amount of stock that must be removed must not make the case depth too shallow.

Minimum and maximum amounts of stock removal are calculated by formulae in which:

A = Basic amount of stock removal
B = Sum of the tolerance on stock removal
C = Sum of the tolerance on working dim

For example, where the working dimension is 0.093 ± 0.004 in. and the amount of stock removal allowed is 0.008 ± 0.012 in., then:

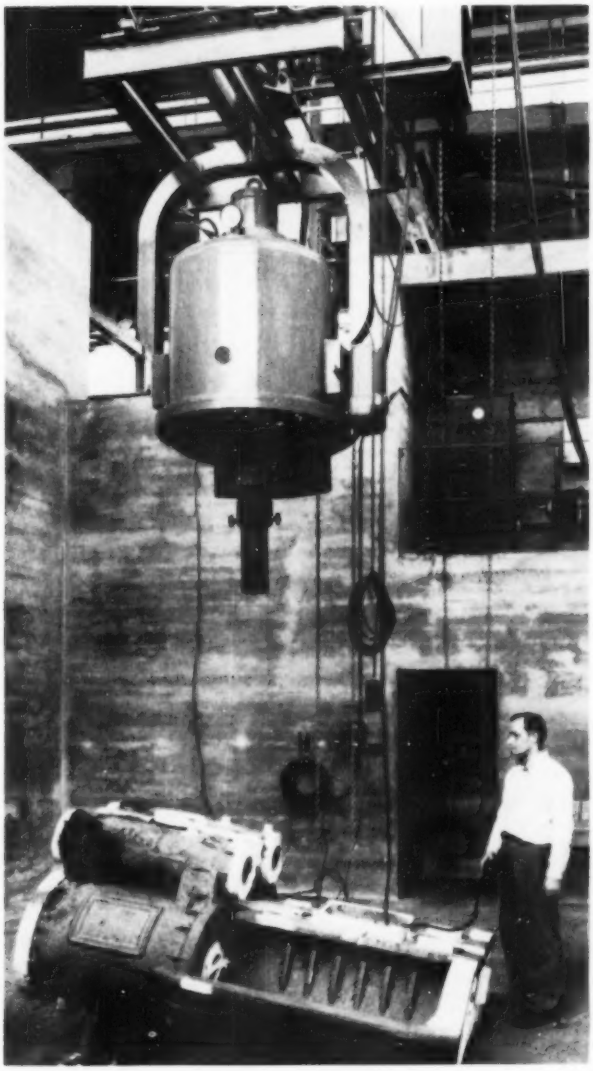
$$\text{Min} = A - \frac{B}{2} + C$$
$$= 0.008 - 0.012 + 0.008$$
$$= 0.004 \text{ in.}$$
$$\text{Max} = A + \frac{B}{2} - C$$
$$= 0.008 + 0.012 - 0.008$$
$$= 0.012 \text{ in.}$$

Of course, any conditions contrary to good machining practice are not allowed merely to satisfy the requirements of a tolerance chart. All dimensions must be given so that they can be checked with a practicable gage, and tolerances must be reasonable for the type of operation being done. An especially important consideration in respect to the use of these charts is that tolerances specified in relation to a non-locating surface that is not being machined in the same operation must be large enough to absorb the variance between the locating surface and the checking surface and still permit the use of set tools and fixed stops.

"It took three days, but I finally got this change in specifications licked."

NON-DESTRUCTIVE TESTING REVEALS CASTING DEFECTS

BY J M ANSPACH, MEEHANITE METAL CORPORATION



HIGH-PRESSURE CASTING under 1,000,000-volt X-ray machine

Good visual inspection is the quickest and cheapest method of culling defective castings before they progress into machining. But the eye is limited. It cannot see many surface defects that lead to product failures. And, it certainly cannot discover sub-surface defects, nor evaluate them, in respect to whether the casting will serve its purpose or not.

Something better than the eye is required for inspection of many castings produced today. Engineering advances have created a demand for castings with increased life under heavier working loads, plus reduction in casting weights. Machining is costly and often dictates the production of castings with minimum stock allowance for finish. These considerations have stimulated the development of four non-destructive testing procedures applicable to castings.

By the use of these test methods, along with good visual inspection, the foundry can determine casting procedures that produce better castings. And if the receiving departments of machining establishments elect to use these methods, they can weed out defective material before it ties up equipment and breaks cutters. Another great advantage is that greater uniformity of structure may be secured, and then the machining rate can approach optimum values.

Each of the four non-destructive testing methods has a specific field of use, and it is not capable of universal application. Therefore, the use of each method is explained, plus its relative cost. For further information on the subject, refer to the Special Report "Non-Destructive Testing Methods" (AM — May 23, 1946).

American Machinist SPECIAL REPORT NO. 330 TO THE METALWORKING INDUSTRIES

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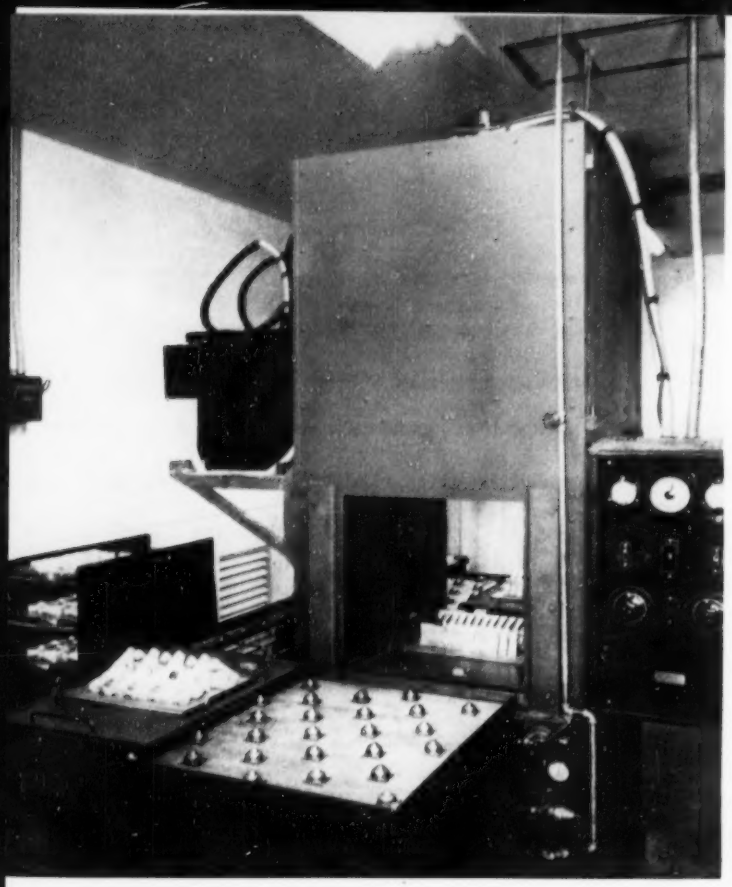


table I . . . EXPOSURE TIMES WITH RADIUM

Film to Source Distance, In.	GA Meehanite Thickness, In.	Milligrams of Radium	Exposure Time Hr.
20	1	100	7¾
20	1	300	2½
20	1	600	1¼
20	1	1000	¾
20	3	100	36
20	3	300	12
20	3	600	5¾
20	3	1000	3½

table II . . . COMPARATIVE EXPOSURE TIMES OF RADIUM AND X-RAY UNIT

Film to Source Distance, In.	GA Meehanite Thickness, In.	Time With Radium, Hr	Time With X-ray Unit, Sec
36	1	8½	50
36	1½	12	90
36	2	18	130

WHERE SMALL CASTINGS are to be X-rayed in a production setup, the machine can be fitted with loading and unloading tables for faster operation

INDUSTRY APPLIES FOUR NON-DESTRUCTIVE TESTING METHODS

Non-destructive tests have geometric limitations in scope and sensitivity. Some test methods require access to both sides of the casting; others can be modified for use as "one-side" tests. Some test methods can be applied to parts of almost any shape or size. Others are limited to areas with reasonably flat surfaces or with constant-thickness sections. Some non-destructive tests allow large areas or volumes to be inspected in a single operation. Other test methods require scanning of each small area suspected of being defective. These limitations must be understood before specifying a non-destructive test for any particular application.

The sensitivity of every type of non-destructive test is limited. Costs can be greatly influenced by proper selection of test methods.

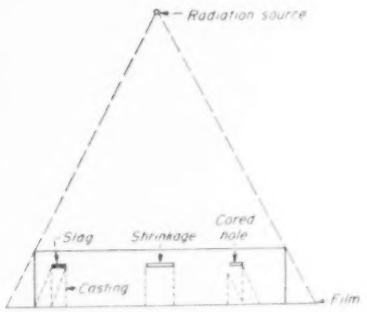
The first results obtained from non-destructive testing might be an increase in scrap percentage. For this reason, quality standards should be raised gradually.

COMMERCIAL METHODS

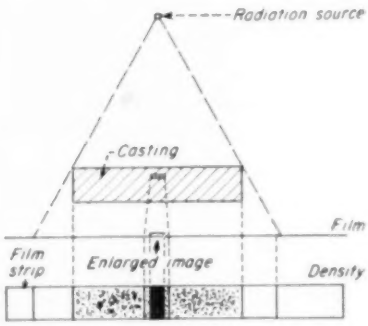
Chief non-destructive-testing methods in use today are:

1. Radiography or penetrating radiation.
2. Magnetic-particle inspection.
3. Penetrant methods.
4. Ultrasonic testing.

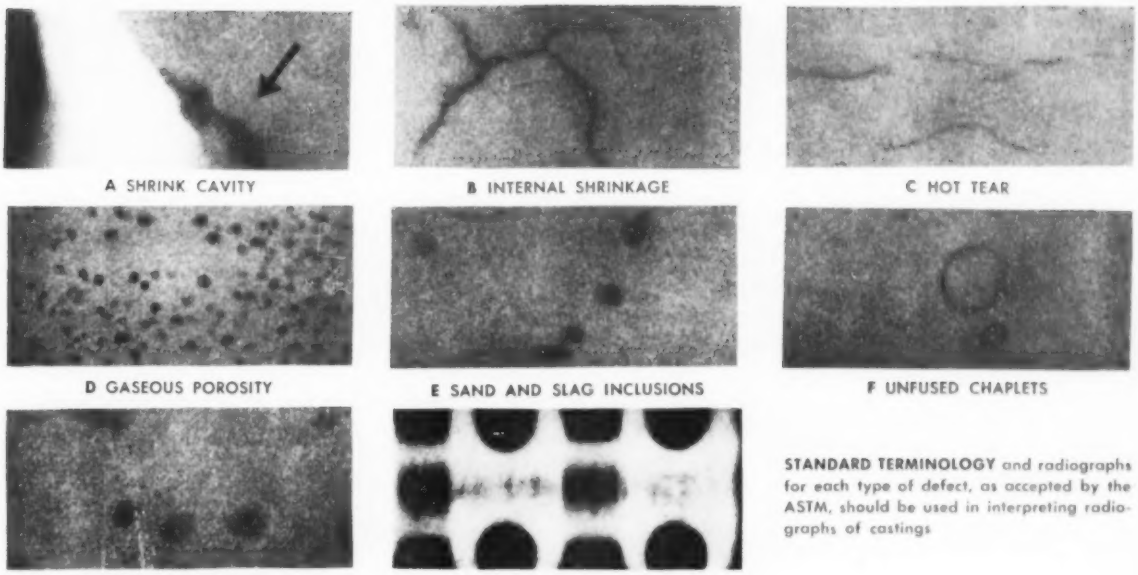
Non-destructive tests must be specifically related to the problem involved. There is no such thing as a general test applicable to every kind of casting, part or structure, nor to all their functions or operating conditions.



Defects in a casting are magnified or shifted on the film, because radiation is emitted equally in all directions



Film should be placed as close to casting as possible, and not as shown, in order to obtain a sharp outline of the defect without enlargement



A SHRINK CAVITY
B INTERNAL SHRINKAGE
C HOT TEAR
D GASEOUS POROSITY
E SAND AND SLAG INCLUSIONS
F UNFUSED CHAPLETS
G SLAG INCLUSIONS
H CASTING WITH SHRINKAGE

STANDARD TERMINOLOGY and radiographs for each type of defect, as accepted by the ASTM, should be used in interpreting radiographs of castings

RADIOGRAPH OR PENETRATING RADIATION

Present industrial inspection techniques employ many varieties of penetrating radiation or beams of high-energy particles. These include X-rays, gamma rays and radio-active elements. Sensitive radiation detectors, such as X-ray film and fluorescent screens, are employed to transform differences in intensity of the radiation into visible images.

Fluoroscopy—In fluoroscopy, the X-ray images are viewed on fluorescing screens, eliminating the cost of X-ray film. Contrast sensitivity and definition of fluoroscopic screens are generally appreciably poorer than those of film radiography. Extremely careful observation is required to reveal defects of less than 5% contrast sensitivity.

The inspector must view the fluoroscopic screen through a protective window of lead glass or of X-ray-absorbing, light transparent solutions. Need for operator protection against emitted X-rays limits the use of fluoroscopic inspection to thin sections and is best suited for the inspection of light-alloy materials.

Film Radiography — Radiography on X-ray film is used for applications in which it is desirable to reveal the properties of a test object in a single exposure. It reveals many different types of defects sensitively and does not require point-by-point scanning. It also provides a permanent record for reference.

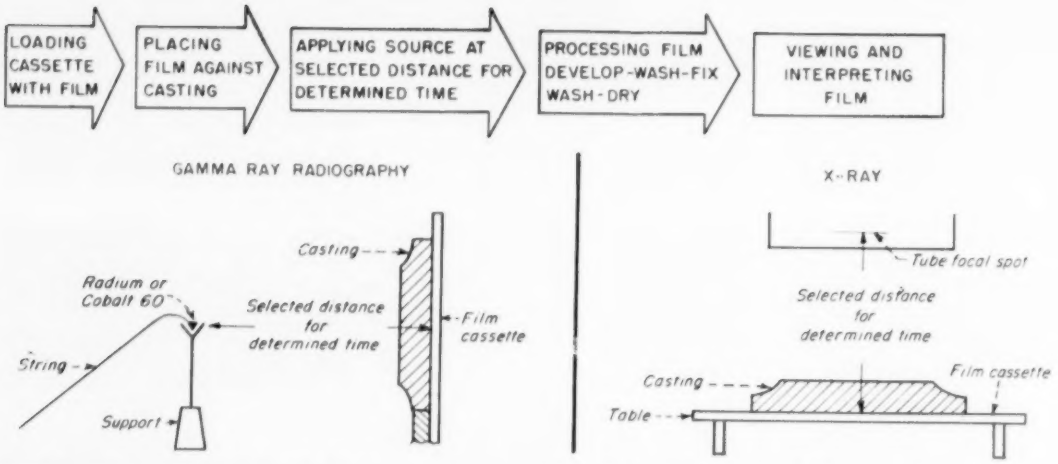
A radiograph is capable of showing (up to 2% sensitivity) the identity, location and size of shrinkage cavity, internal shrinkage, hot tears, cracks, gas holes, gaseous porosity, sand and slag inclusions, unfused chaplets and in some cases change in densities of metal.

Sources for film radiography are X-ray and gamma rays, the latter being produced by disintegration of radium and radioactive isotopes, of which Cobalt 60 is possibly of greatest industrial value at this time. Equal results can be obtained from these sources, but their selection is governed by installation costs, material costs, size of casting to be radiographed, portability and speed.

Radium salts are the most intense source of gamma rays, and radium has a half life of 1580 years. Radioactive isotopes decay far more rapidly. Cobalt 60, the best of these, has a half life of 5.3 years. Its activity is expressed in millicuries of milligrams of radium equivalent, and because of decay the exposure calculations must be revised each five or six months. Rental cost for a 100-mg unit of radium is about $300 per year, whereas purchase cost of a 500-mc unit of Cobalt 60 is about $200.

The X-ray unit provides speed. For example, a 2-in. ferrous casting may be X-rayed in 100 sec with a 250-kv unit, whereas with 300 mg of radium as a source and the same source-to-film distance, the exposure time would be about 1¾ hr.

Procedure for making a radiograph of a casting is to apply film against the casting and locate the source at a selected distance to pass rays through casting for a given length of time. It is necessary to place the film as close to the object as possible. A defect some distance from the film will be enlarged and will not have as great a visual contrast as one near the film. This is due to the scatter effects of the transmitted rays. Lead sheets (known as screens) are used on each side of the film to help prevent scatter radiation from fogging the film and also for



WHEN A RADIOGRAPH is made by either X-ray or gamma-ray procedures, it is essential to use suitable exposure calculators or charts, considering the distance from the source, film characteristics and power of the source

intensifying action on the image.

Necessary items for gamma radiography are: a means for supporting the capsule during the period of exposure, calipers for determining wall thickness; penetrameters to check radiographic sensitivity; a rule to measure source to film distance; lead numbers and letter markers for film identifications; cassettes for holding films during exposure; photographic tape or other suitable means for fastening the cassette to the object being radiographed, and dark-room equipment.

It is well to remember a few vital facts when viewing radiographs: Voids, cavities or other discontinuities in metal of uniform density will appear as dark areas on a film, whereas materials of higher density than the metal will appear lighter on the film. Materials such as sand, slag, or other foreign matter with a lesser density will appear as dark areas on the film, likewise surface cracks, scratches or depressions will appear dark. Sections radiographed from a casting larger than the film may be marked with chalk showing the outline of the film.

Standard radiographic terminology should be used in interpreting defects on radiographic film, along with standard radiographs for each type defect, as accepted by the ASTM. With the use of standard film the radiograph can be used as a tool to determine the grade or quality of a casting.

Not only should radiography be used to accept or reject a casting but it should be used as a tool to determine size and location of feeder and chills. Practical results have been obtained in developing correct mold and pouring practice. Correct size chaplets for proper fusion are also determined. In some cases radiographs of gates and feeders determine their size and location.

Film manufacturers have produced a number of different type films to produce high contrast and maximum sensitivity where highest possible speed is needed.

SAFETY PRECAUTIONS IN RADIOGRAPHY

As rays are emitted from their source in equal direction and continue until absorbed by distance or a material blocking their path, it is necessary to take proper precautions in locating a radiographic area. If the area is protected by lead or concrete, it should be thick enough to prevent radiation from passing through in quantities large enough to harm anyone on the outside.

The International X-ray and Radium Protective Commission has called the International Unit of quantity or dose of X-rays or gamma rays the "roentgen." The National Committee on Radiation Protection has recommended the permissible maxium total dosage rate to which any part of the body of a person shall be permitted to be exposed continuously or intermittently to 0.006 roentgen per hr.

Since radioactive materials, unlike an X-ray machine, cannot be "turned off," the only method available for protection against over exposure is to reduce the time any person is in close proximity of the unguarded source. Castings, films and stand for the source should all be in place before the capsule is removed from its storage volt. Under no circumstances should any part of the body be brought closer than a meter to the unguarded activity. Nor should any person remain longer than necessary within a distance of 25 ft of the capsule during an exposure. The exposure area should be marked or fenced.

MAGNETIC-PARTICLE INSPECTION

For castings, a test is needed to examine the articles for cracks, non-metallic segregations and shrinks while in the rough or after heat-treatment. The method must not involve delays in shipment or use and should be relatively inexpensive. For such purposes, the magnetic-particle test is extensively used.

There are numerous methods used in magnetic-particle inspection, and generally they may be divided into two groups. By the first method, magnetic currents or fields are set up in the casting by

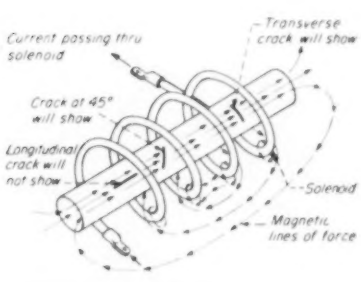
solenoid or toroidal windings; in the second, the specimen is magnetized by direct contact with a conductor. The first method is generally used for small or irregular shaped castings or where no difficulty is involved in placing the casting directly into the magnetic field. The second method is generally used for large castings, because a welding machine or generator producing a current from 400 to 600 amp can readily be used.

Direction of the magnetic field is always important. A complete or partial break in the path of a magnetic field causes formation of local poles. These can be detected by various means; the most convenient way is by applying finely divided particles of a ferro magnetic material. These particles offer a lower-reluctance path to leakage flux than does air or liquid, hence they tend to gather in such a field and to outline its boundaries.

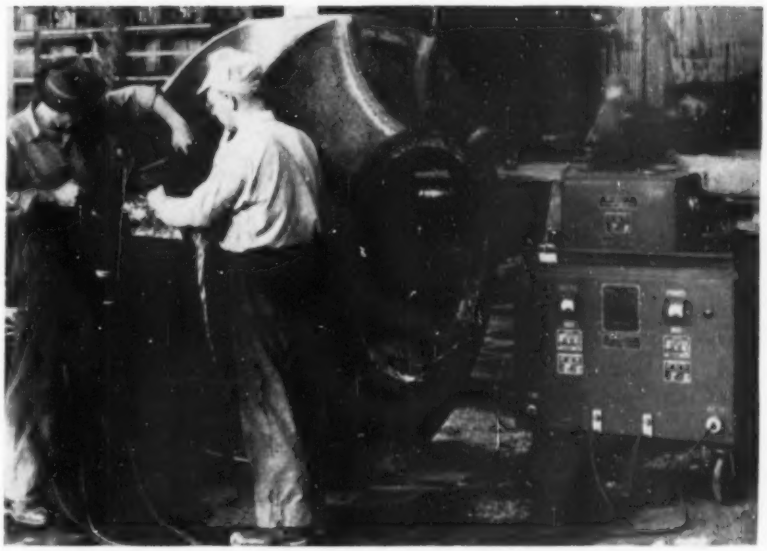
Dry-Power Method — Surface condition and casting size influence the method of applying the magnetic particles, and color of the powder depends largely on color of the casting. Magnetic powder may be applied from a shaker can, a rubber bulb, a loosely woven bag or other device. Where large areas are to be covered, a blower or air-gun applicator is an economical way of applying magnetic powder.

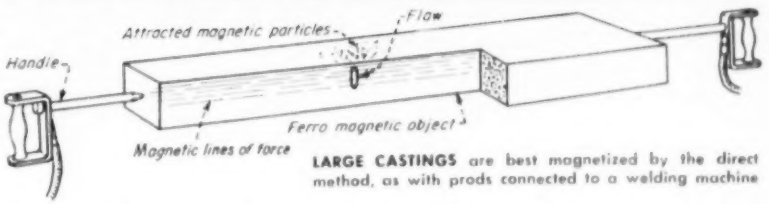
Wet Method — When magnetic particles are suspended in a liquid, the suspension may be flowed over the object by hose and nozzle. Or magnetized objects may be suspended in the tank for a short period. Fluorescent pastes and powders do not differ in physical or magnetic properties from standard magnetic powders but give increased visibility and contrast of the defect when viewed in completely darkened rooms or inspection booths under so-called "black light." An indication produced with the fluorescent-coated particles glows with a brilliant light.

Magnetic-particle inspection of castings is useful as a complement to radiographic inspection.



MAGNETIZING OF WORK by means of a solenoid or toroidal winding is used for small parts, and is not effective to discover flaws parallel to the winding axis



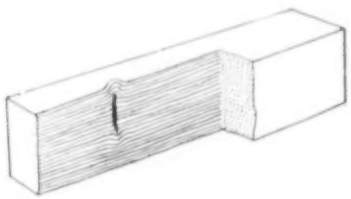


LARGE CASTINGS are best magnetized by the direct method, as with prods connected to a welding machine

Magnetizing Technique — The technique of magnetization is the chief factor in determining the effectiveness of the test, which is a qualitative, not a quantitative, one. It will search out and find a discontinuity, but usually other means must be used to evaluate the magnetic-powder indication. It has its limits in searching for internal defects but is outstanding with respect to surface and immediate undersurface defects. For uniform test results, the casting surface should be clean and as smooth as possible, although it is not necessary to grind or machine the surface before inspection.

The magnetic current may be rectified ac or dc. Source of current may be welding generators, either one or more connected in parallel to produce the necessary current. Storage batteries built especially for magnetic-powder inspection offer a portable source of current.

Powder Characteristics — The powder used should have low magnetic retentivity. Particles should be of such size and shape that they are readily mobile over the surface of the casting. Commercial



BREAK in magnetic field caused by subsurface defect. Magnetic powder is attracted by local poles so created

SMALL CASTINGS should first be degreased, dipped in fluorescent material, dried, and then powdered (right) to hold oil seeping out of defects

COMMERCIAL EQUIPMENT aids inspection of fluorescent-treated parts under black light

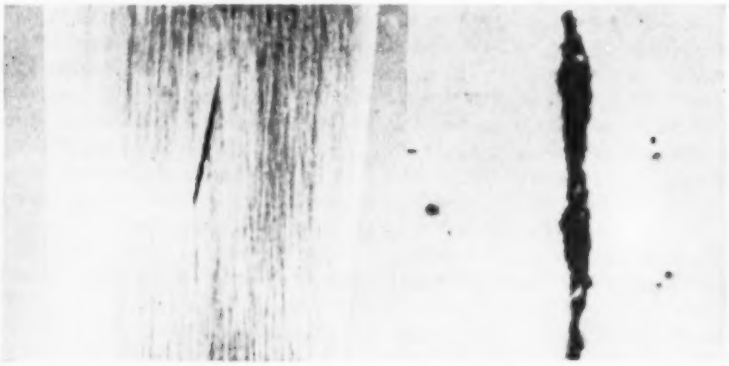
powders are colored for visibility.

Possibilities of varying the sensitivity of the method are numerous and complex. In ferromagnetic materials the magnetic field is always stronger while the magnetizing current is flowing. Therefore, high sensitivity is obtained by applying the powder or suspension simultaneously with the magnetizing current. This method is the "continuous" method.

A relatively less sensitive method is to apply the powder or suspension after the magnetizing current is shut off. This method is known as the "residual" method.

Choice of magnetizing current also affects sensitivity. Ac, because of skin effects, magnetizes the surface layers of the material more strongly than those deeper in the casting. Dc gives a more uniform field intensity over the entire cross section. For purposes of magnetic-particle inspection, rectified ac gives the same results as dc. The best magnetizing procedure for location of subsurface defects is to use single-phase, half-wave rectified current.

A recent development enables castings to be subjected to multi-directional magnetization at one shot. One application of particles reveals defects in any direction.



PARAMAGNETIC POWDER clings to a crack (right) revealing a defect (left) that would not have been seen unless magnified

BY FLOWING fluorescent material over large castings and exposing them to "black light," cracks will be revealed

PENETRANT METHOD

A penetrating liquid is used in conjunction with a suitable developer to reveal surface cracks, pores and similar discontinuities. This test is generally used on non-magnetic material, but may also be used for magnetic materials.

One of these penetrants is "Zyglo," a fluorescent material that utilizes black light for detection of defects. This water-washable material has high wetting or penetrating properties, and is readily drawn into extremely small surface openings by capillary action. The dye carried in solution fluoresces brilliantly when exposed to black light.

To obtain effective penetration it is first necessary to remove dirt and grease by washing with hot water or sand blasting. The penetrant is applied by spraying or immersion. After applying the penetrant it is necessary to remove all excess from the surface. A water spray is recommended. The casting is then dried and examined under a black light.

By application of light-colored powder to the casting's surface, some of the penetrant may be blotted, to increase effectiveness of the test. Shrinkage, grinding and fatigue cracks and porosity open to the surface are easily detected.

ULTRASONIC TESTING LOCATES DEEP FLAWS

Use of ultrasonic sound waves for detection of flaws in castings has become important. These short waves are reflected from small flaws. Another useful property is their ability to travel in a straight line with a searchlight effect. Ultrasonic waves are able to penetrate thick sections of steel and gray iron.

There are three basic methods for utilizing ultrasonic energy for the inspection of materials. They are: The reflection method, the through-transmission method, and the resonant-frequency method. The first two methods are used for the detection of flaws while the third is employed for determining material thickness from one side of the object.

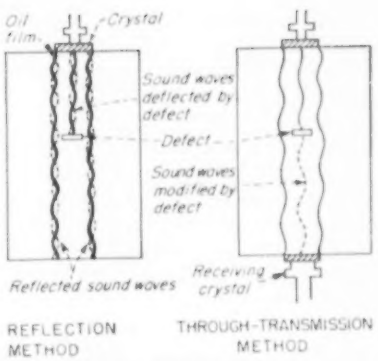
In the reflection, or "echo" method, when ultrasonic waves transmitted through material hit a boundary or discontinuity, the waves are reflected back toward their point of origin. With the through-transmission or "shadow" method the ultrasonic waves are allowed to pass through the material and are picked up at the opposite side. If a discontinuity is encountered, the loss at that area will be greater than the normal loss between the energy entering and that picked up at the opposite side.

The reflection method is used in the ultrasonic reflectoscope. A typical pattern on the oscilloscope screen will show two peaks, one representing the initial pulse or surface of the material and the other the reflection from the other side. A discontinuity will result in a "pip" occurring between the two peaks. A calibrated square wave superimposed on the screen locates depth of the discontinuity accurately. It is necessary to scan the surface of the object in a geometrical pattern to assure receiving a reflection from any discontinuity present.

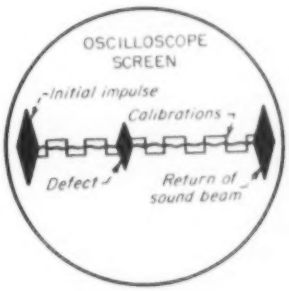
For proper coupling between searching crystal and object, a smooth surface is necessary, although not a machined surface. To aid coupling, a liquid such as light machine oil (SAE 10-30), transformer oil or glycerine with a wetting agent is used between the crystal and the object.

The depth of penetration achieved in a given material depends chiefly on grain size. Forged and wrought ferrous materials are easier to penetrate than castings. Present models are designed to penetrate 30 ft of steel.

Graphite flakes in gray iron produce a marked effect on sensitivity of ultrasonic inspection. The graphite flakes produce scatter effects, thus affecting echos received from small flaws to the point they may not be noticed if of the same size as the graphite flakes. Engineering grades of Meehanite metal have proved acceptable for ultrasonic inspection. Depths up to 120 in. have been tested with type GA Meehanite castings. With the same settings, type GE Meehanite was good for only 36 in. penetration. Recent experiments show that penetration of nodular iron is five times greater than for regular gray iron. GA Meehanite metal is about equal to nodular iron in allowing penetration of ultrasonic waves.



TWO ULTRASONIC METHODS are employed to locate hidden defects in thick material. The reflection method is most commonly used for castings and forgings



BY MEANS of a calibrated screen on the oscilloscope, the operator can determine the depth of the defect from the surface

The minimum size of discontinuity that can be detected is roughly one having a projected lateral dimension equal to about 0.1% of the distance from the crystal to the defect. As the defect is sighted on the oscilloscope no permanent record is made.

SELECTION OF NON-DESTRUCTIVE TESTING METHOD

Because any method of non-destructive testing is expensive and time consuming, all castings should first be given a thorough visual inspection. This step removes faulty castings from the production lines at the earliest possible moment, without further work or expense.

Steps to be followed in selection of non-destructive inspection and the cost ratios are:

1. Penetrant and magnetic-particle tests are searching means to disclose surface discontinuities not found by normal visual inspection methods. These tests disclose fine surface cracks and micro-shrinkage not revealed in a practical manner by other non-destructive tests.

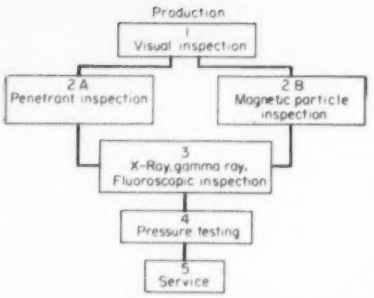
Magnetic particle inspection

costs about 10 times and penetrant inspection about 15 times as much as visual inspection (including material costs).

2. Radiographic tests, including X-ray, gamma-ray and fluoroscopic examination, are means of ascertaining the soundness of castings. The equipment required for rapid X-ray work, suitable for volume production, is extensive and costly. Gamma-ray equipment is not too costly but it is slower and limited in volume of production. Fluoroscopic work requires the use of an X-ray machine and auxiliary equipment, and is limited to light-section castings with low density. Fluoroscopy does not require costly films and its operation is rapid, with costs about 15 times as much as visual examination.

Radiographic inspection with film costs approximately 125 times that of visual inspection, but provides a permanent film record. Radiographic tests provide for internal examination of soundness, which is of major importance. All of the radiographic processes require personnel trained in technique and interpretation.

3. Ultrasonic inspection is used for internal examination. Although there is no permanent record, the method is sensitive and the costs are about equal to magnetic-particle inspection. The equipment is compact and portable.



STARTING with a casting of certain inherent qualities, the general sequence of non-destructive testing follows this pattern. The number of steps will depend upon service requirements and what may have been revealed by prior tests

RENTAL OF NON-DESTRUCTIVE TESTING-EQUIPMENT

Radium—This may be rented on a monthly basis from radium dealers throughout US and Canada. Average price is $300 per milligram per year. See Table I for exposure times with various weights of radium.

Cobalt 60—The short half life and the low purchase prices makes the rental of Cobalt 60 unpopular. The purchase price of Cobalt 60 equivalent to 300 mg of radium is around $450.

X-ray Equipment—At the present time there is no known X-ray equipment rental service, although there are a large number of commercial laboratories throughout the country doing both X-ray and gamma-ray work for private foundries. A complete list may be obtained by writing to the Non-Destructive Testing Society, 1109 Hinman Ave, Evanston, Ill.

The US Navy has a number of mobile X-ray units throughout the country that will assist in X-raying government work. General information may be obtained from any US Navy Inspector's office in the United States or from the Philadelphia Navy Yard.

See Table II for a comparison of 300 mg of radium and a 250-Ku X-ray unit.

Reflectoscope-Ultrasonic—Sperry Products, Inc., will rent or sell an instrument that can be carried by hand and operates at 115 volts, 60 cycles.

Magnetic - Particle Method — Equipment must be purchased from the Magnaflux Corp., Chicago. A license must also be obtained. That company's Zyglo process is also licensed.

RELIABILITY OF TEST AND INSPECTORS

In most non-destructive tests, it is necessary to detect and evaluate flaws and defects, or to determine strength and serviceability by indirect procedures. Evaluations are usually based upon the experience and judgment of skilled inspectors and operators. In cases of doubt, inspectors tend to be conservative, particularly in the absence of reliable service data, and this tendency may raise rejections unnecessarily.

In evaluating non-destructive test methods, it is important to discriminate between the reliability of the test method and the judgment of the inspector.

The American Society for Testing Materials has produced standards for film radiography. These standards grade defects into five classes and the customer may specify what class of radiographic examination is permissible.

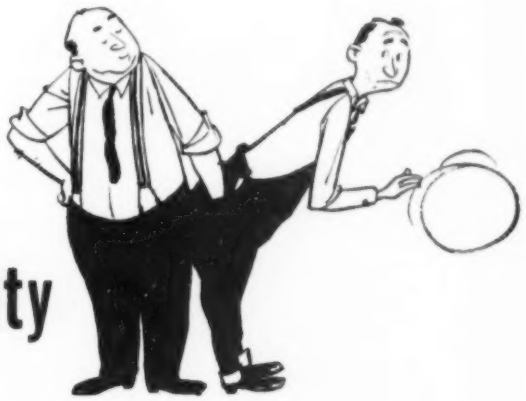
The US armed forces will inspect radiographic testing equipment and give a routine test to the technician. If the test is passed, the laboratory will receive a certificate qualifying it to do non-destructive testing for the US Government. Once a laboratory receives a certificate, it may change personnel and still maintain its certificate. Government certificates given for magnetic-particle inspection are based upon examination of the particular inspector and his job. A different examination is given to the technician, inspector and supervisor. If the individual leaves his job, the person replacing him must also qualify.

The American Society of Non-Destructive Testing has realized the necessity of training people to operate non-destructive testing equipment and develop them to detect and evaluate flaws and defects. They have set up and operated training courses in Detroit, New York and Philadelphia. The American Foundry Society has joined with the Non-Destructive Testing Society on training courses.

Information concerning other training programs can be obtained from: Magnaflux Corp; General Electric X-ray Corp; Non-Destructive Testing Society; Sperry Products, Inc; and American Foundry Society.

ROUND TABLE

Not-So-Sweet Charity



"I just don't like the idea of extracting all that dough from the men, Ed!" Ed and Al were walking to the parking lot after a foreman's meeting on the annual community-fund drive.

"Can't think of any better way to do it, Al, can you?"

"As a matter of fact, I can. I just remembered somebody telling me about some other shop where they have an unofficial welfare fund. Everyone pays out a fixed amount each month, and the guy who gets elected to take care of the fund doles out the cash for flowers and gifts when the occasions arise. He bases his decisions on what he thinks is fair and necessary for each contribution. We could try that, Ed."

"Maybe it's worth a try, but I can think of a good objection. The way the boss put it for us this time, each man should put in 10% of one week's pay. That's fairer than a fixed amount. After all, little Bernie, the trucker, can't afford as much as you can."

"Well how about making it 1% of your salary each month—that should be fair."

"Nuts to that, chum. Then everyone finds out how much everyone else is making, and you know that would only cause trouble."

"Sure. You're right there. But I don't like this big wallop all at once. Besides, it will end up with the boss basing his estimate on how good a foreman you are by the amount you collect. If I can't make the quota they've assigned to me, is it my fault?"

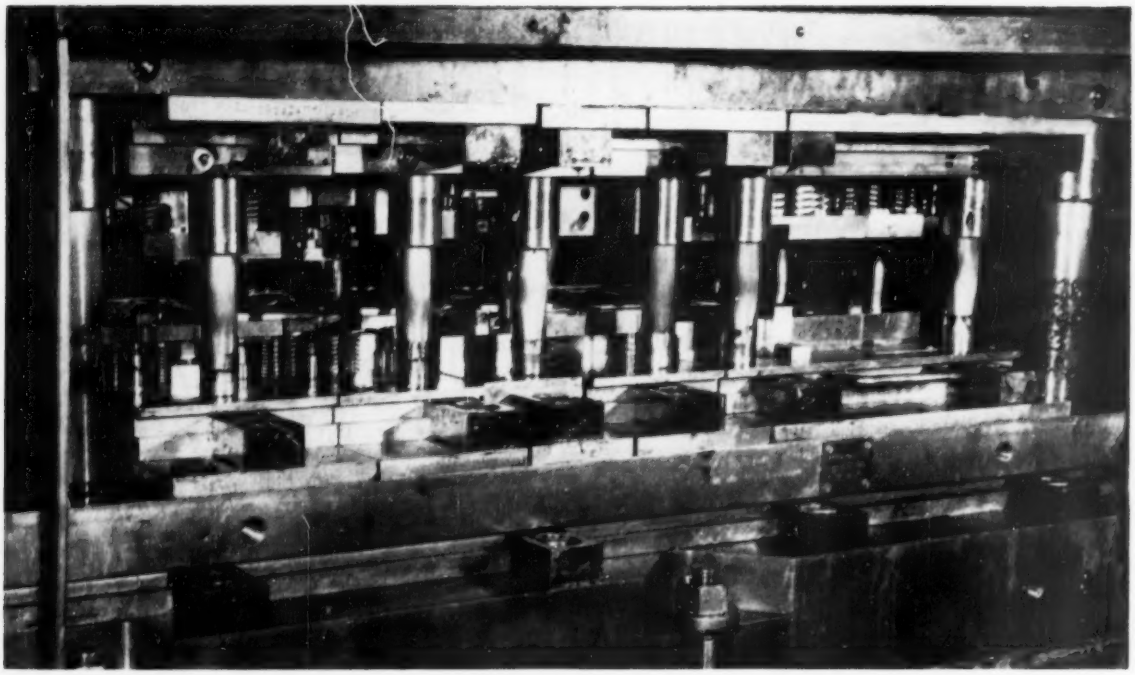
"Maybe it is, Al. You should have some influence over your men. Everyone admits the community chest is a fine idea; so why not go ahead and see if you can get them to fork over?"

"It gravels me, Ed. Next thing you know they'll make it a paycheck deduction, just like income tax. It seems to me that each man should put in whatever he wants to—or none, if he figures that way. After all, it's his money."

"Yeah, but everyone has some duty to his community, Al. A lot of people don't think about it, so they have to be pushed."

"Then maybe we'd better make it the same price for all, and keep it simple."

***SHOULD** a foreman be held responsible for charity quotas in his department? How's the best way to raise money for a worthy cause? Is Al's welfare idea suitable for fund-raising campaigns? Your ideas and opinions will interest others. Discussions of earlier topics appear on later pages.*



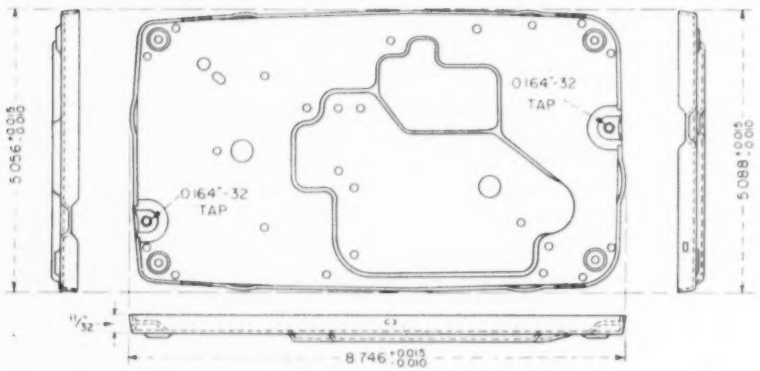
SETUP in a No. 6150 Bliss press with 24-in. die space, 4-in. stroke, and 1½-in. adjustment, the six-station progressive die for making Type 500 telephone-set baseplates is mounted on a special 6-in. thick bolster

PROGRESSIVE DIE HAS TWO TAP HEADS

BY GEORGE W PIPER
Product Engineer, Indianapolis Works
WESTERN ELECTRIC COMPANY

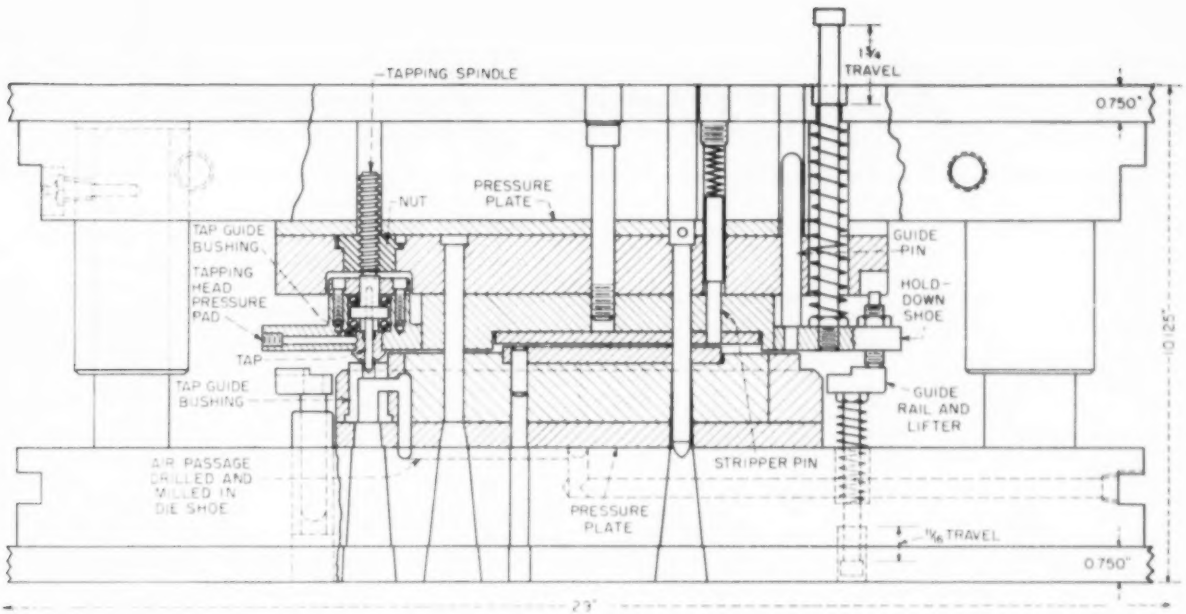
Drawn-steel baseplates for the new Type 500 telephone set manufactured at the Indianapolis Works of Western Electric Company are finished complete, except for cleaning and finishing, in a large six-station progressive die operated at 45 strokes per minute. This includes tapping of two 0.164-in. 32-thread holes for mounting screws.

Except for two die-actuated tapping heads built into one of the stations, die design is conventional. Five diesets (one arranged for two of the six stations, the rest for one station each) are lined up side by side on a 3-in.-thick baseplate which maintains alignment of the individual dies.

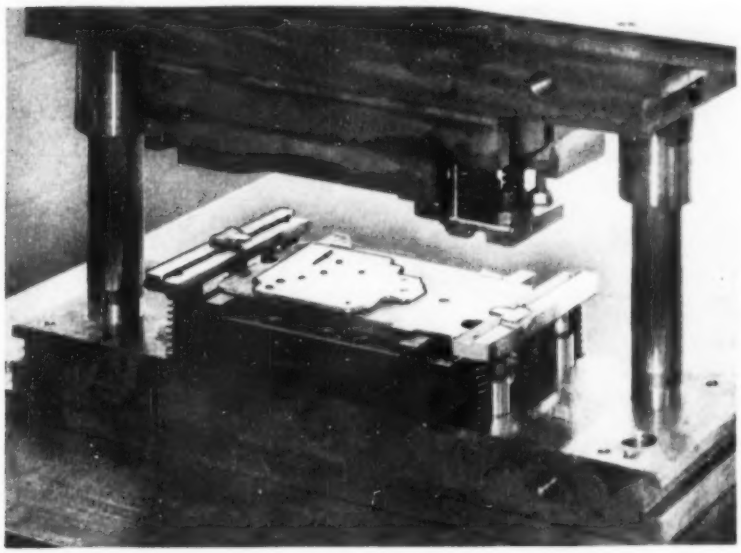


BASEPLATES for Type 500 telephone sets are formed from 0.042-in.-thick, 10 ½-in.-wide mild-steel strip delivered to the press in 2500-lb coils. Parts are finished in one setup, including tapping two holes, then are cleaned, grit blasted, dipped in black lacquer, and delivered to phone assembly benches

Strip stock (mild low-carbon steel similar to SAE 1020, in No. 5 temper and with a No. 3 edge) is fed to the die from a 2500-lb coil, through a Littell roller leveler and roll feed at the right-hand end of the press. Feed is 6.125 in. per press stroke. The part is progressively pierced, notched, drawn and embossed, tapped and bumped to size sides and embossings, and sheared from the scrap strip at a rate of approx 1700 per hour. Lubrication applied for these opera-



ASSEMBLY of one of two tapping heads is detailed in this cross-section. Air at shop pressure is supplied through channels in die shoe to pocket under each tap to blow chips out of way through holes in shoe and bolster plates. Thrust ball bearings insure easy turning of tapping spindle as pressure pad moves toward or away from punch unit



TAPPING AND BUMPING DIESET for six-station progressive die here is shown removed from the press for adjustment. Spring-supported guide rails hold strip above die face during feeding cycle, and tapping head is suspended from the punch assembly. Two pilot pins keep pressure pad aligned with workpiece, and three heavy die springs provide pressure to hold pad against work face

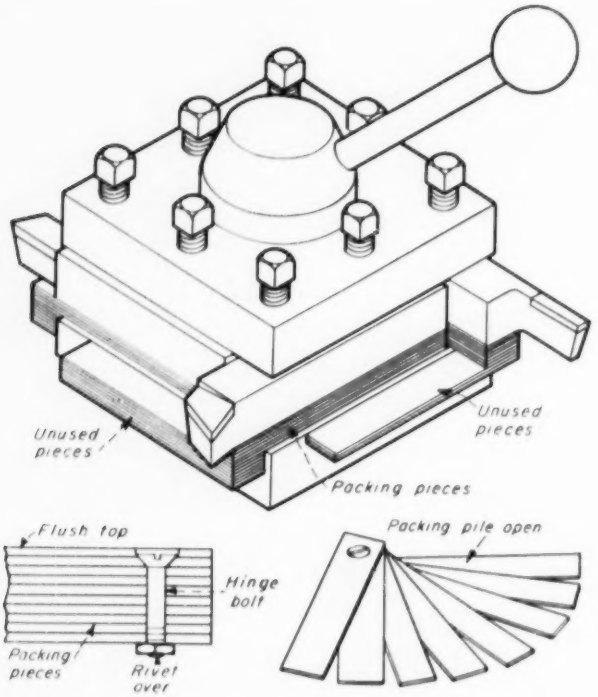
tions is carried over in sufficient quantity to lubricate the taps.

The two tapping heads are mounted in the fifth die station (fourth die unit) and each drives a No. 8-32 (0.164-in.-32) tap through previously pierced 0.145- to 0.152-in.-dia holes (normal tap drill for a full thread with a No. 8-32 tap is 0.136-in. dia). Each head has a spring-loaded pressure pad which contacts the workpiece before the die bottoms, so that pressure is exerted on the threaded tapping spindle forcing it to revolve four times as it is pushed upward through its supporting phosphor-bronze nut. Only 1½ threads are required in the 0.042-in. thick stock.

Tapping spindle (made from tool steel, hardened to 60-62 R_c) and its mating nut have ⅜-in. OD, ½-in.-lead quadruple left-hand acme threads, so forcing the spindle upward in the nut causes it to rotate counterclockwise for properly turning the righthand threaded tap it is driving. Upward return of the press ram relieves pressure on the tapping-head pad, and as it moves away from the punch shoe, the tap spindle is rotated in the opposite direction so the tap will be withdrawn properly from the workpiece.

The pressure pad of each tapping head carries a hardened tool steel (54-58 R_c) guide bushing which is precision tapped with a No. 8-32 thread. The tap turns in this lead nut as it is rotated into and out of the work, insuring an accurate lead in the hole it is tapping despite variations in ram speed. Tap life averages 20,000 to 25,000 parts. High tap life undoubtedly is a result principally of the low percent of full-thread depth in the holes being tapped. Heavier threads would impose more load on the taps, causing more rapid wear and more frequent breakage.

Practical Ideas



Laminated Shims For Toolbits

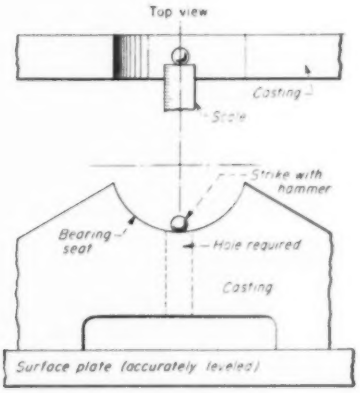
Tool setup in the cross-slide toolposts of turret lathes requires a lot of time for selection of the correct thickness of the packing strips placed under the cutting-tool shanks to raise the cutting edges to the required height. Generally, loose bits of strip steel are used for this purpose and as the strips are often of different thickness, tool setting is an unnecessarily prolonged and fumbling operation.

One way to speed tool setting is to adopt a standardized tool packing arrangement which is easily adjusted to the desired thickness. The packing piles are made from several strips of flat steel, about 1/32 in. thick, hinged together at one end by a countersunk-head screw. The strips are clamped together by a nut on the screw, which is locked in place by riveting over the screw end.

Packing strips can thus be spread open like a set of feeler or thickness gages. When used in the lathe toolpost, the number of strips necessary to produce the required packing thickness are twisted around 90° to the remaining pieces in the pile and inserted under the tool shank. The unused pieces in the pile lie along the front face of the toolpost, where they offer the least possible interference to machine operation.

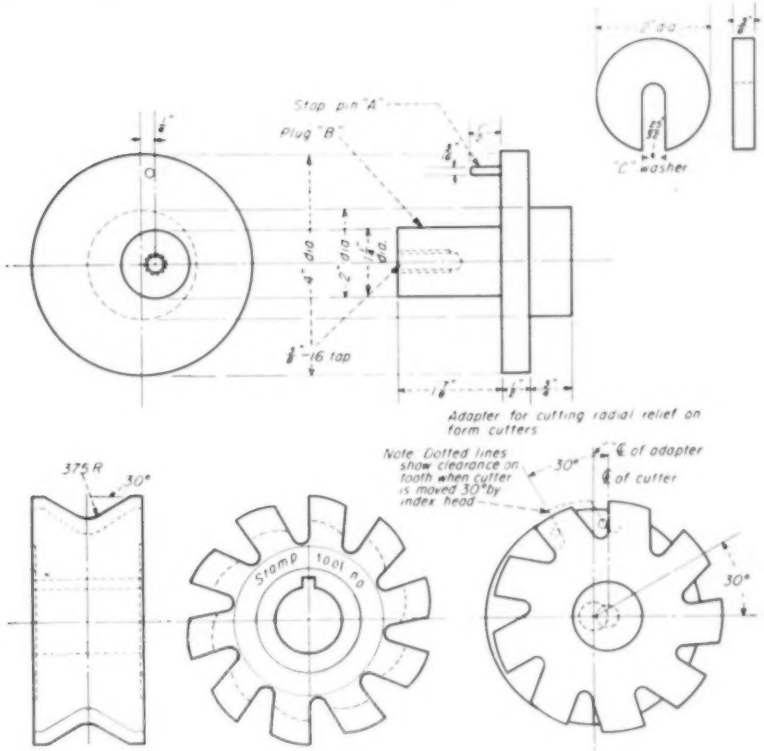
With leaves or strips made from material of 1/32-in. thickness, any cutting tool can be located for center height within 1/64 in. If the addition of one leaf makes the tool point too high and its removal from under the tool results in a low setting, it is apparent that the correct setting lies within half the thickness of a leaf, or 1/64 in. This is generally accurate enough for most tools, except in the case of small-diameter-work adjustment.

Four laminated-packing piles, all exactly alike, have resulted in greatly reduced tool-setting time on turret lathes doing small batch work.—*Clifford T. Bower, London, England*



Ball Locates Center On Partial Bore

We had a small quantity of castings, for a machine, having a bearing seat less than a half-circle in circumference. It was necessary to drill a hole within 0.005 in. of the true vertical centerline of this bored seat. After trying several time-consuming methods including a dial indicator mounted in a drill chuck, we used the simple principle shown. A 0.250-in.-dia steel ball was placed into the bottom of the seat and positioned from the edge with a scale. After the ball came to rest, it was lightly tapped with a hammer. A magnifying glass was used to locate the center of the resulting indentation and this was center-punched. Of course the casting was mounted on a carefully leveled surface plate before using the ball. Results were well within the necessary limits. In addition, the seat must be smooth and the ball hardened. *H J Gerber, Stillwater, Okla*



Form Cutters in a Hurry!

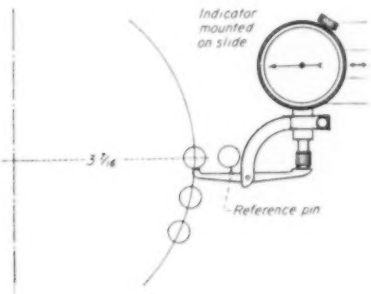
Make an adapter as shown and rough form the cutter blank on the periphery of the cutter. This can easily be done in the lathe.

On a mandrel and between index-head centers cut the flutes in the cutter. Next set the adapter in the chuck of the index head, holding it on the 2-in. diameter, turn the crank on the index head so that stop pin "A" and the centerline of plug "B" are perpendicular to the milling-machine-table surface.

Set the cutter on the adapter so that the tooth face is against the stop pin. With a boring head in the horizontal spindle, set a single-point boring tool to 0.375-in. radius. Move the table up and in so that the tool comes in light contact with the cutter tooth face. Now, by turning the crank handle the cutter will have a radial motion up and into the boring tool, giving radial relief on the cutter.

Back off the crank so that the cutter will be in the original starting position. Now move the cutter so that the second tooth is against the stop pin and repeat the previous operation as at first and proceed around the cutter until all of the teeth are cut.

Now by setting the vertical spindle over at 30° to the axis of the cutter, and 90° to the tooth face, with the center of the endmill on the edge of the cutter tooth face, and the endmill periphery tangent to the 0.375-in. radius, proceed with the same operations as cutting the radius. *John Galeazzi, Clifton, NJ*



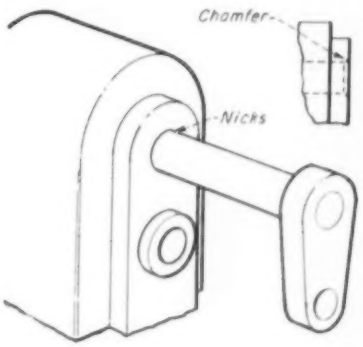
Dial Indicator Helps Calibrate Instrument

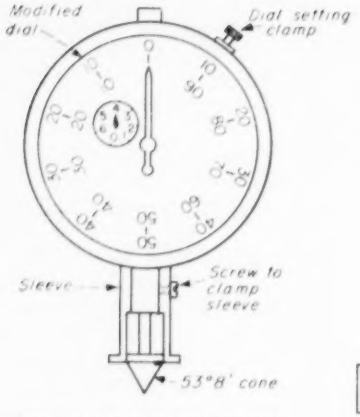
Some instruments we were required to check had to balance out at zero voltage every 10°. If the voltage was not zero, a dial was turned until zero was obtained and then the location taken again.

By mounting a series of pins at every 10° on a 6 ⅞-in. bolt circle and indicating each pin relative to a fixed "zero" pin, each 0.001 in. on the dial indicator shows that the instrument is off by that amount in minutes of arc. We tried vernier calibration, but that lacked sufficient accuracy. *C Sorenson, Racine, Wisc*

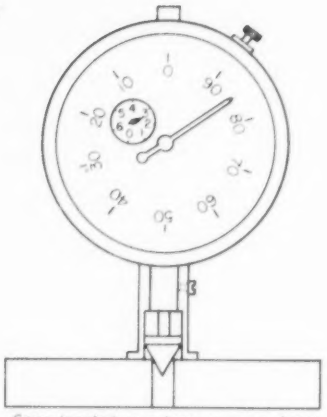
Nicks Spoil Miller Accuracy

After using a new milling machine for a short time we discovered that the vertical head was not square with the table. Upon inspection we found some slight nicks around the mouth of the sleeve that carries the overarm. As the edge of this hole was very sharp, the nicks were caused by inserting the overarm. By chamfering this hole, nicking was eliminated and misalignment corrected. *J D Cuyler, Chatham, N J*





Cone and sleeve-on dial indicator.



Gage located in a bore giving a direct reading of 2.85"

Modified Dial Indicator Gives Direct Boresize

For jig-boring small holes, we wanted a quick method of testing. Before we used this idea, we used plug gages, but found these slow; hence we modified a dial indicator. First we re-marked the dial to give a reverse reading, (a new dial can be made, or the original dial can be covered with adhesive paper and re-marked).

Next we made a steel sleeve, to fit the bearing bushing on the gage; this we fastened with a small brass screw.

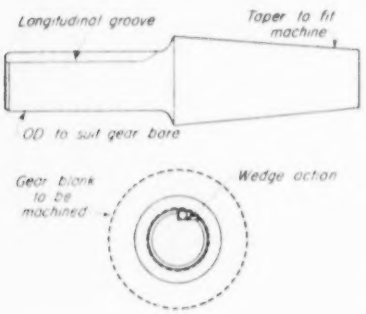
The standard "button" on the gage was removed, and replaced by a cone, ground to an angle of 53° 8′. This cone was screwed into the dial indicator measuring rod, as shown, and the gage was then set to a standard hole, (in our case it was a ground bore of 0.375 in.) and the dial indicator face was turned around to this figure and set in position by the setting clamp on the indicator case.

As the cone is ground to an angle of 53° 8′ and the gage is calibrated to 0.001 in., gaging is accomplished by resting the gage on the top surface of the work being bored and, as the cone contacts the edge of the hole first, the amount the measuring rod is depressed until the sleeve contacts the top surface is simply subtracting itself from the original gage setting, thus giving a direct dial reading. The cone is made to 53° 8′ to give a ratio of 1-1. Thus each 0.001 in. that registers on the dial is equal to 0.001 diameter of the bore. The gage is used to rough out the bores, but final checking is made by plug-gage.—*Allan Clarke, Rochdale, England*

Pin-Mandrel Speeds Workloading

We manufacture many sizes of gears and sprockets with bores that vary greatly. Naturally, we wish to minimize time in chucking or holding the work during machining, hence holding the parts has always been a problem.

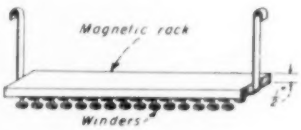
Recently, a method was brought to my attention by the foreman that is known as a "pin mandrel"; a frequently forgotten tool.



A piece of round stock is cut to length, faced, and centered on both ends. One end is turned taper to fit the lathe, or whatever machine is used. The other end is turned to the O D of the bore being machined. If a great many gears are made, it is well to harden and grind the mandrel.

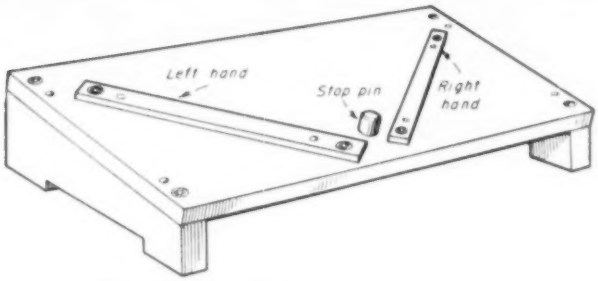
Next, the mandrel has a groove cut longitudinally so that the side of the milling cutter is in line with the center of the mandrel. The cut is made about 0.005 in deeper than the size of pin to be used. The "pin mandrel" we made uses a 3/16-in. dia dowel.

In use, the piece to be machined is slipped over the mandrel, and the 3/16 in. pin is slipped into the groove. A slight turn of the part rolls the pin over and locks by wedge action. Pressure of machining causes a tighter grip. A slight turn in the opposite direction loosens the workpiece. It is a quick acting lock, and holds the work concentric. — *Norman A Benson, San Jose, Calif*



Magnetic Plating Rack

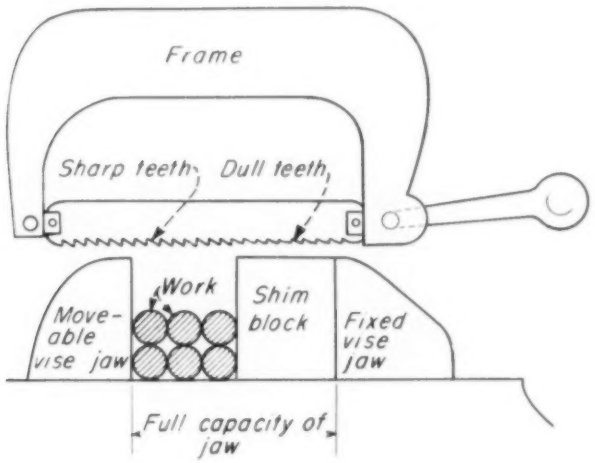
We were recently faced with the problem of electroplating bright nickel and chromium on a number of wrist-watch winders. The quantity was not large enough to successfully barrel-plate them and they were too small to wire. Hence, we used a weakly magnetized plate as a plating rack and current strong enough to hold the winders in position. As the top of the stem was brass, this method worked very well. — *Frank Spicer, Yorkshire, England*



Angular Cradle Avoids Expensive Jig Setup

Here is a simple drill jig cradle used in low-cost tooling when one hole involves compound angles and the other holes are perpendicular. The operator drills all of the perpendicular holes and then places the jig on the cradle for the angular hole. This cradle will simplify making the jig as well as aid in jig-boring the part. It can be used as shown for both left- and right-hand parts. The tooling is much cheaper than is the grinding of compound angles on the jig itself, as is usually done.

The cradle consists of two tool-steel legs, roughed, drilled and tapped, hardened, and finish ground to the proper angle "X". To these legs is attached the top plate which contains the locating strips and the stop-pin, dowelled and capscrewed in place. Of course, as it is used in making the jig, the cradle must be built prior to the other tools. *Stuart E Wadsworth, Homer, New York*



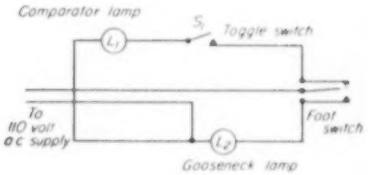
Double Hacksaw Blade Life

When a dozen power hacksaw blades were brought into my office for sharpening, I noticed that only the first half of blade was dull, while the balance didn't even have the paint scratched. I examined the balance of the blades and found that in nearly every case, only half (or less) of the blade's length was dull.

In all power hacksaws, the rear vise-jaw remains stationary at all times. Thus when small pieces are cut, only a small portion of the blade length is used. In an 18-inch blade length, such as ours, the saw has a width capacity of 10-inches. When cutting material 5 in. wide, or smaller, only the first half of the blade is actually used.

To use the second half of the blade length, it is simple to "shim out" the work,, to use that part of the blade. After both sections of the blade become dull, it may be sharpened in the usual manner. Thus, on small or medium sized work, each blade will have twice the length of service.

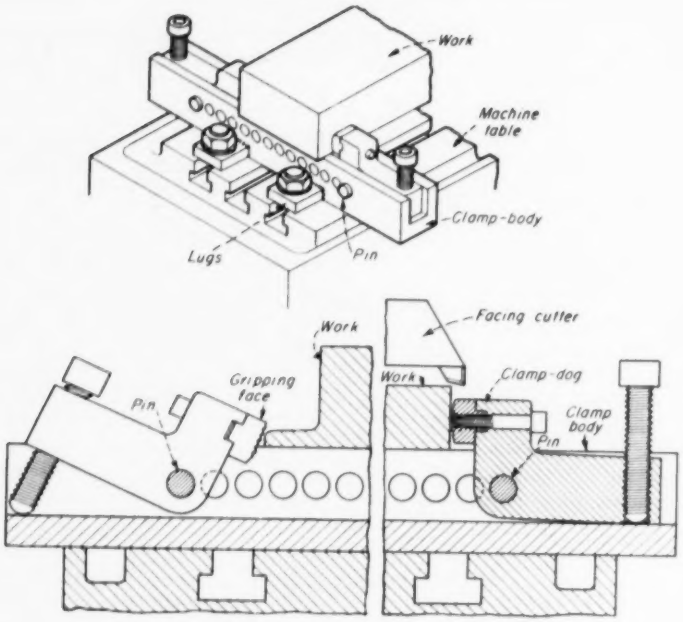
We made a shim block which was easily clamped to the rear vise-jaw. Needless to say, our overall blade savings show about 80 percent longer life.—*A F Scoblic, Milwaukee, Wisc*



Comparator Switch

Here is a simple improvement that can be made to optical comparators used in many shops. Basically, this addition is a footswitch which can be obtained with a small neon lamp to facilitate location of the switch in darkened areas.

The circuit is arranged such that either the comparator light source (L_1) or a surface light (L_2) is on. This surface lamp can be an overhead light or a "gooseneck" attached to the machine. Operation of the footswitch causes one light to go on and the other to go off. An additional switch (S_1) of the simple "on-off" style toggle is introduced so that the comparator can be shut off when not in use. This switch has been arbitrarily placed in the comparator-lamp circuit. *Ernest J Druan, Jr, Malden, Mass*



Quick-Acting Miller Clamp

Surface machining of flat surfaces is now practiced widely on vertical milling machines fitted with negative-rake facing cutters. A lot of work done by one general shop starts initially as a forged steel billet which must be surfaced to size as a preliminary operation. The billets are of varying dimensions, hence it was decided to make up a universal clamping and locating set which would cover a wide range of billet sizes, enabling them to be clamped easily and quickly in position on the milling-machine table.

The clamps are in pairs—one at each end of the work—and comprise a length of 2-in.-sq mild-steel bar. A pair of lugs at each side accommodates clamping bolts which hold the clamp body to the machine table.

Each clamp body has a rectangular-section slot milled lengthwise and in this slot fits a pair of clamping dogs, each pivoted on a hardened steel pin. The pins fit into transverse holes drilled at close intervals along the length of the clamp body and by altering their positions, by slipping them into various holes, the distance between the clamp dogs may be varied to suit various work widths.

Each clamp-dog pivots about its pin under the action of the socket-head bolt which screws into its heel. Screwing the bolt into the dog causes its rounded end to press against the bottom face of the longitudinal slot in the clamp body; thus force the serrated pad into contact with the work by rotating the dog.

The pivoting movement of the clamping dog about its pin causes the serrated gripping face to be forced into the work at an angle which holds the work firmly against the top surface of the clamp body while holding it sideways. The clamp bodies act on the work in the manner of parallel supports. In addition to the speed of loading and unloading provided by this tool, it supplies a down-holding action which is preferred for most heavy milling operations. One jaw can be actuated by an air cylinder for faster operation. *Clifford T Bower, London, England*

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PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS — Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author —every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product — in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 36, N.Y.

Mills, Drills, Spotfaces and Taps Bearing Blocks

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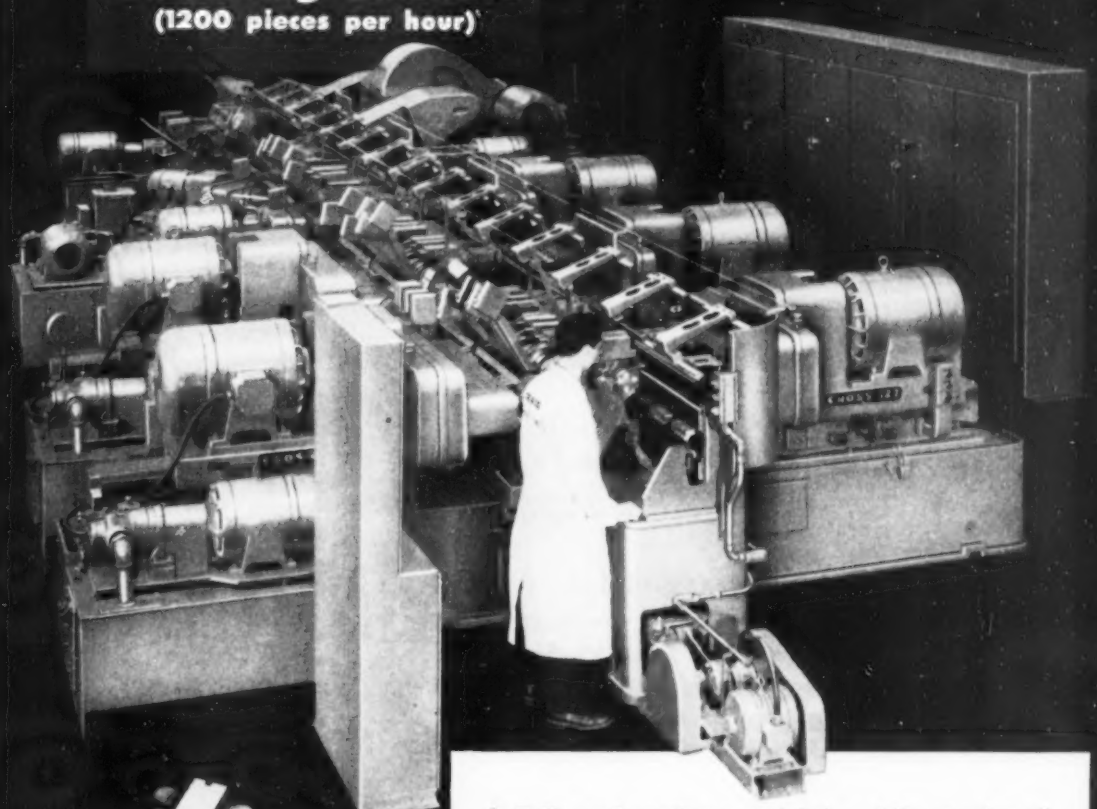

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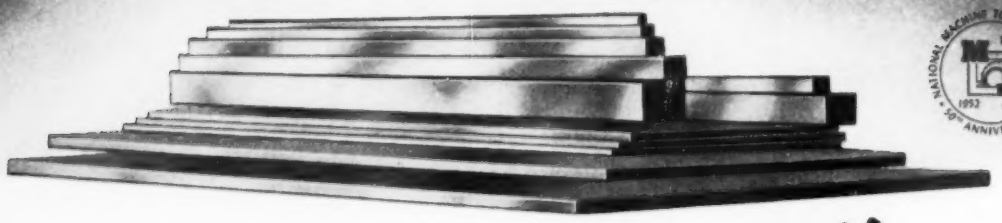

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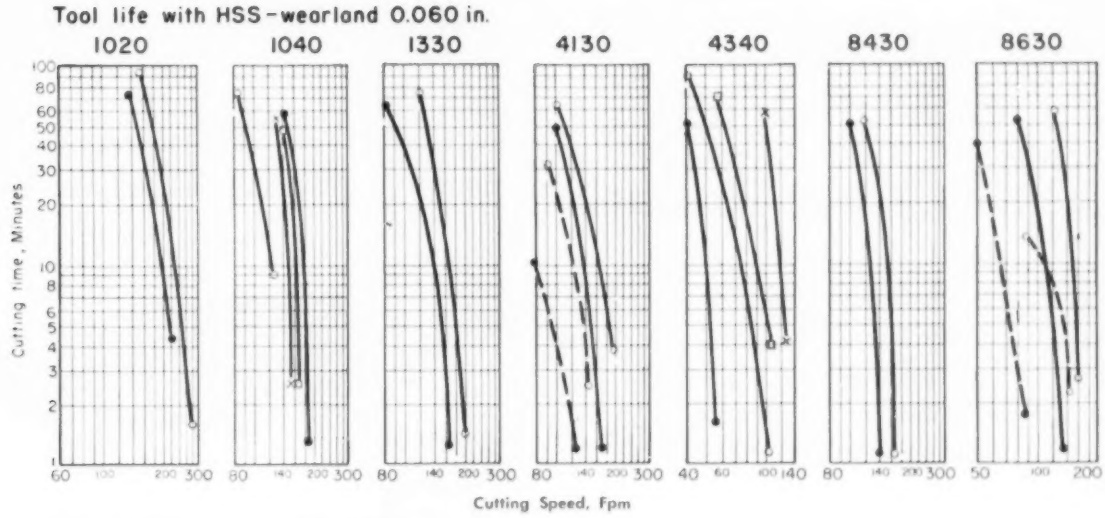
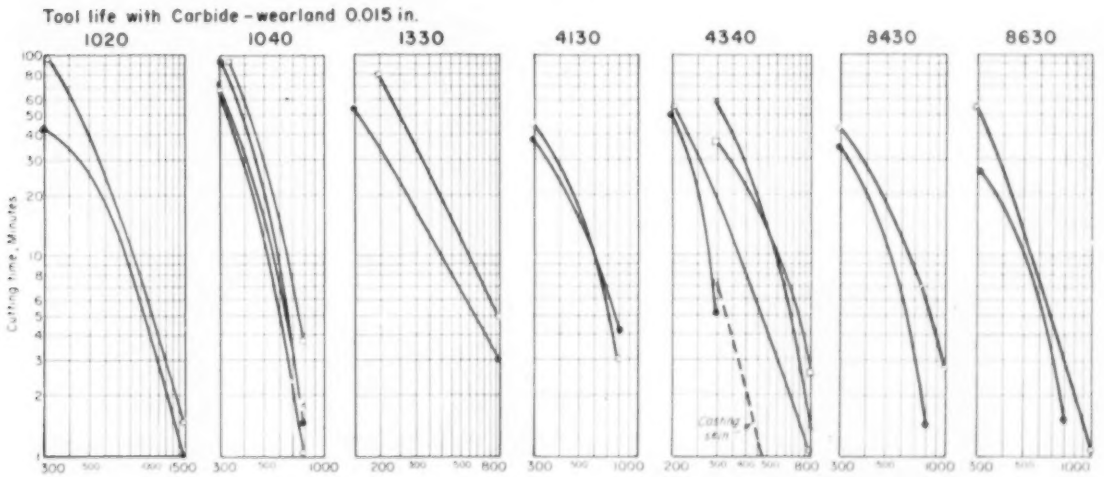




These charts show the tool life in terms of cutting time *vs.* cutting speed. As outlined in a previous instalment, these charts are used to determine the intervals at which tools should be changed by balancing productivity against tool costs.

KEY TO MICROSTRUCTURES

1020 annealed
1040 normalized & oil quenched
1330 normalized & tempered
4130 annealed
4340 quenched & tempered—300 BHN
8430 normalized & tempered—180 BHN
8630 annealed

1020 normalized
1040 normalized & oil quenched
1330 normalized
4130 normalized & spheroidized
4340 quenched & tempered—400 BHN
8430 normalized & tempered—200 BHN
8630 single normalized

1040 single normalized
4130 normalized & spheroidized

1040 double normalized
4340 normalized & annealed

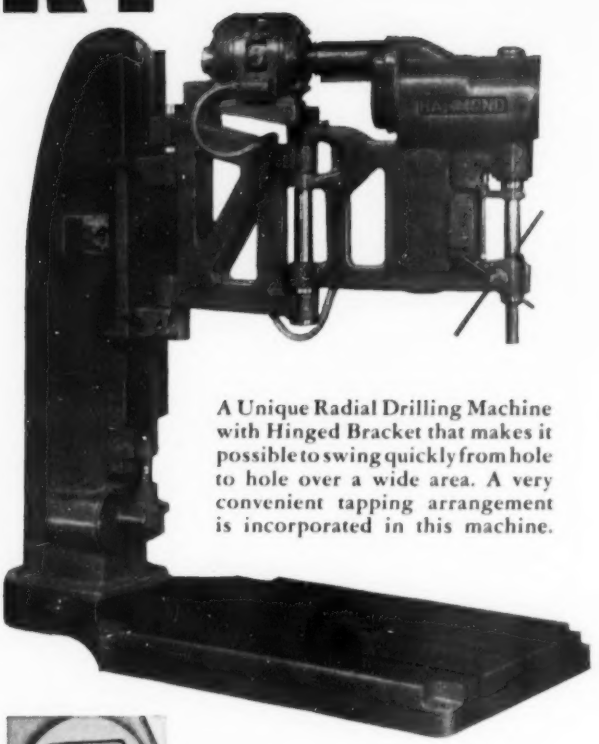
Cutting base metal

Cutting casting skin

FOOTBURT

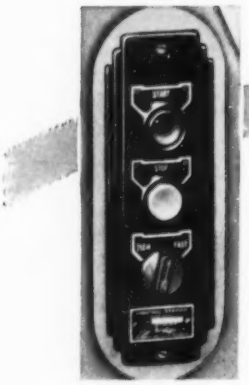
machine
tools
for
increased
production

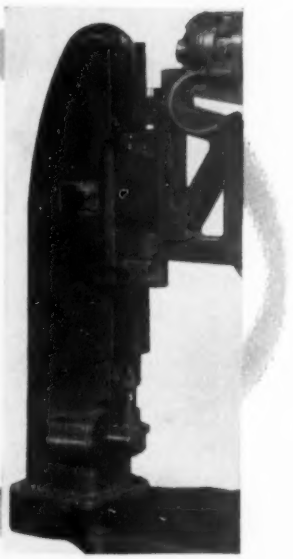
engineered for production



A Unique Radial Drilling Machine with Hinged Bracket that makes it possible to swing quickly from hole to hole over a wide area. A very convenient tapping arrangement is incorporated in this machine.

Here is a machine designed to perform light drilling and tapping operations at high speed with minimum of effort. Any one of six spindle speeds may be quickly selected and tapping is always instantly available without any adjustments to the machine. It makes an excellent choice for miscellaneous work on a large layout of varying size holes.





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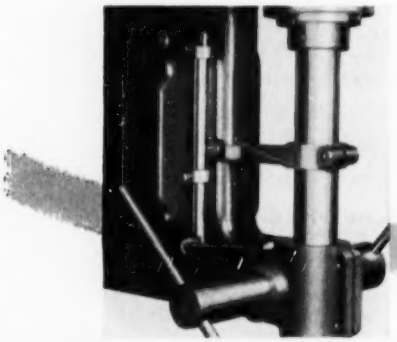

FOOTBURT

machine tools

American Machinist

REFERENCE BOOK SHEET

Estimating Drilling Hp and Speed

By TYLER HICKS

POWER NEEDED to drill steel depends on drill size, feed and drilling speed. This chart permits fast approximation of the horsepower required to drill steel when drill diameter and surface speed or rpm are known. It is based on the normal feed rates given below. It may also be used to find drill rpm when surface speed is known or to find surface speed when rpm is known. For these purposes the chart can be used for any material because there is no relation between the physical dimensions of the drill and material being worked.

EXAMPLE 1: How much power is needed to drive a 1-in. drill in steel at 500 rpm? Feed is 0.014 ipr.

SOLUTION: Enter the chart at the left at a drill diameter of 1 in. on the power scale and draw a straight line through 500 rpm on the right-hand scale. At the intersection with the power scale read 7.75 hp, say 8 hp.

EXAMPLE 2: What is the surface speed of this drill?

SOLUTION: From 1 in. diameter on the speed scale at the left, draw a straight line through 500 rpm and read the surface speed as 130 fpm on the surface-speed scale.

Feeds used for constructing this chart are:

Drill dia, in.	1/8	5/32	3/16	1/4	5/16	1/2
Feed, ipr	0.004	0.0045	0.005	0.006	0.008	0.010
Drill dia, in.	5/8	3/4	7/8	1	1 1/4	1 1/2
Feed, ipr	0.011	0.012	0.013	0.014	0.016	0.016

Values and equations used in this chart are based on data developed by the National Twist Drill & Tool Co. These equations and data are available in Kent's *Mechanical Engineers' Handbook*, p 23-70, Design & Production volume.

TOUGH STUFF
Axelson lathes make your tough jobs easier, delivering constant precision work, even under the most difficult operating conditions. This chip, a sample of the rugged cuts Axelson lathes can make, is from a ship shaft of #6140 chrome vanadium alloy steel 16" in diameter. Cut was made at 25 s.f.m., feeding at .240 per revolution; depth of cut 1". Tough stuff? Sure, but it's easy when you use an Axelson lathe.
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Safety Tips for Conveyors†

GENERAL DESIGN

Be sure that mechanical equipment is not loaded beyond rated capacity.

Design mounting so chances of catching sharp edges or of pinching are minimized.

Pipe lubricating points out to safe areas.

Make adjustments to takeups or drives accessible.

Use anti-backup and anti-runaway mechanical safety stops on slopes as protection against chain breakage.

Use load breaks as overload cut-out protection.

Enclose counterweights; use guard rails; interlock conveyors electrically to prevent jamming and the danger that occurs when one conveyor shuts down and the one feeding it is still operating.

Watch design of transfer points from one conveyor to another as here lies the possibility of pinch-point and dangerous free materials.

Make sure supports, particularly for portable conveyors, are substantial to avoid tipping under load.

CLEARANCE AND ACCESSIBILITY

Leave space for maintenance.

Provide visibility so oncoming loads can be seen.

Where the conveyor is high, provide guarded catwalks.

Wherever wall or floor openings occur, guard well with rails.

Provide inspection doors and peep-holes where conveyors are enclosed.

Make proper provision for crossovers, aisles, passages, leaving ample clearance and head room. With paint, signs and/or lights clearly define these ways of travel.

INSPECTION AND MAINTENANCE

Lubricate on a regular basis.

Be sure takeups are properly adjusted.

Examine cottered connections, couplings, and clutches periodically for weaknesses.

Replace worn parts.

AUXILIARY EQUIPMENT

Don't forget that tunnels, pits, hoppers, and chutes used with conveyors should be considered in the same light in the over-all safety design.

OPERATING PRACTICES

When instructing those who work around conveyors, these general safety rules might be included with other specific instructions:

Tell operators to obey rated-load signs.

Have **stop** and **start** stations marked clearly; make them easily accessible; locate them where they provide a clear view of the conveyor along its length.

Insist on no riding on conveyors and no stepping on conveyors.

Don't permit anyone except regular maintenance men to service conveyors.

While servicing, stop the conveyor system and lock out normal starting push-button stations.

In case of overload cut-out, locate jam and use lockouts before starting or servicing.

If a conveyor is shut down for servicing watch that the work is not being done too closely to another moving conveyor. A number of serious accidents have occurred because the serviceman, absorbed in his work, leaned back into another moving conveyor or a slowly moving load came along and squeezed or pinched him against the stopped conveyor or a wall opening.

When a conveyor is being installed, even though you need it badly, don't start using it for production until it is formally turned over to you by the manufacturer. The systems must be run and the bugs must be taken out. Clearances between guides and moving parts may need to be relieved. It's hard to design and build a conveyor system that does not need any field adjustment after shipment and the variations in the user's plant are taken into account. By far the most accidents have occurred at this point in our experience.

Watch loading of conveyors. Be sure the hookup is secure if its a hooking job. If materials are piled on the conveyor, watch that they aren't top-heavy.

Remember clearances between conveyors and walls. Clearance for a man to walk through should, wherever possible, be based on the largest load conveyed.

Authorize certain persons to operate certain conveyors just as you would a machine tool. Keep others from starting the systems. Speed variations in conveyor lines should be entrusted to one who understands what effect these changes have on the system as a whole.

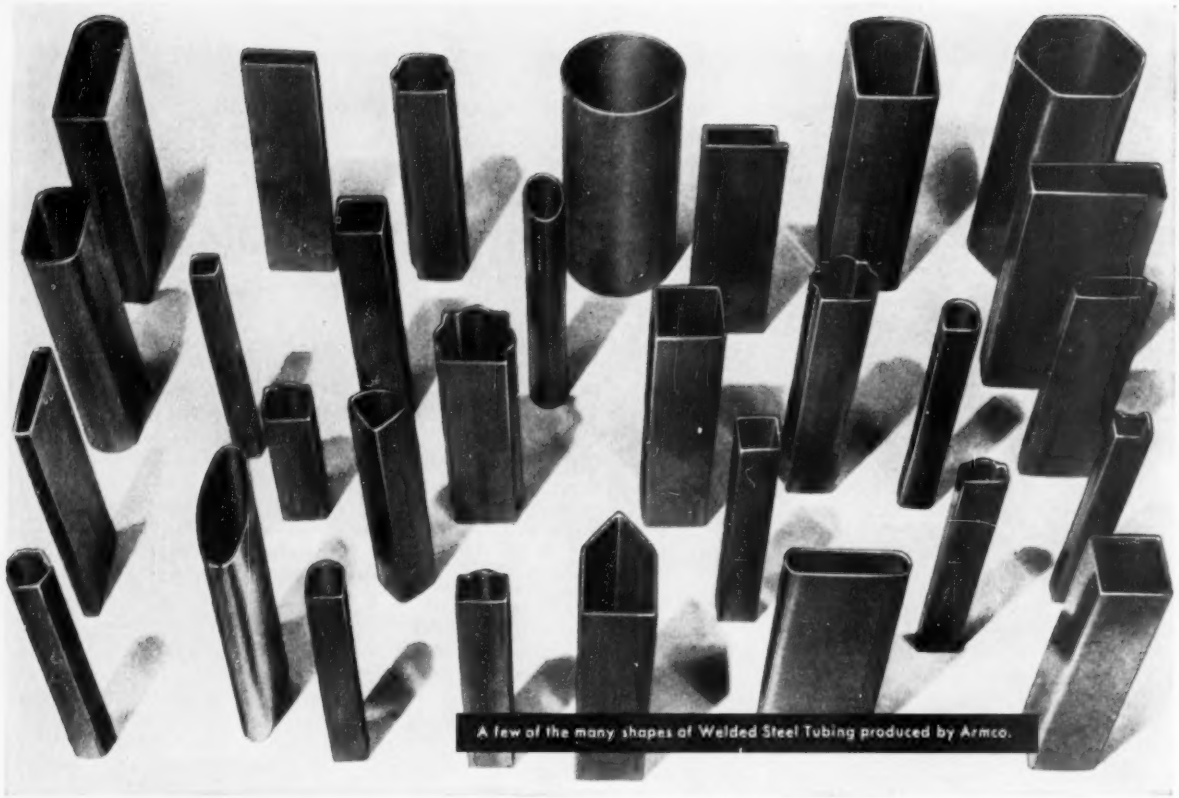
OVERLOAD PROTECTION

If overload cut-out are continually operating or shear pins are continually shearing, contact the manufacturer of the equipment and find out the cause of jamming. Check as to whether the system is overloaded by means of a dynamometer. If the design is light, get it heavied up before trouble starts.

Have a number of push-button stop stations along a conveyor line. Insist on electric ground wires, particularly on portable conveyors and systems operating in the outdoors or in damp conditions. Insist on heavy high quality electrical equipment. Stay on the high side of electrical codes. For added details on safe practice, the following safety codes are suggested:

Safety Code for Conveyors and Cableways and Related Equipment, Bulletin B20-1-1947; The Safety Code for Mechanical Power Transmission Apparatus (ASA B15-1947); the Electrical Safety Code (ASA C2); The Safety Code for Cranes, Derricks and Hoists, (ASA B-30 2-193) and the Safety Color Code for Marking Physical Hazards and the Identification of Equipment, (ASA Z53.1-1945)

† *Adapted from a paper by Jervis C Webb, vice president and gen mgr, Jervis B Webb Company, at the Annual Meeting, American Society of Mechanical Engineers.*

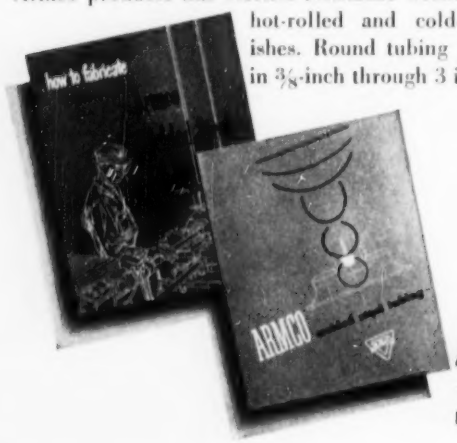


Use Armco welded steel tubing for streamlined strength

Here's the tailored "structural steel" that can give you an excellent combination of strength-per-pound and attractive appearance, along with easy fabrication.

A WIDE SIZE RANGE

Armco produces this electric resistance welded tubing in hot-rolled and cold-rolled finishes. Round tubing is supplied in 3/8-inch through 3 inch outside diameter with wall thickness range of 0.028-inch through 0.095-inch. In addition there are square, rectangular, hexagonal, octagonal and special shapes. A range of coated tubing is made in ZINCGRIP and ALUMINIZED. For complete information on sizes, gages, tolerances and applications, let us send you the booklet, "Armco Welded Steel Tubing."



IT'S EASY TO USE

If you are not familiar with the methods of assembling tubing you can become so quickly. Just write for the booklet, "How to Fabricate Armco Welded Steel Tubing." Its 24 pages are packed with information on the various ways of cutting, bending, swaging, tube-end forming with special tools, joining and other operations on tubing.

ARMCO STEEL CORPORATION
1903 CURTIS STREET, MIDDLETOWN, OHIO
EXPORT: THE ARMCO INTERNATIONAL CORPORATION

ARMCO

TALKING SHOP

Light Up

GOOD LIGHTING is so important at the point of work that press users are installing lights right in press throats. The operator or setup man can keep an eye on the functioning of expensive tools and stop presses or make adjustments before expensive smashups occur.

Safety Specialist

SAFETY for workers and of machines is increased when one tool engineer is trained in safety matters and reviews all installations from the safety angle. A plant using this technique has not had a fatality in a number of years and has cut its accident rate sharply.

Quote

NO ONE BELIEVES in experimental data except the man who takes it, but everyone believes in results of theoretical analysis except the man who makes it.—*"Testing Topics," Baldwin-Lima-Hamilton.*

Tunnel or Chute?

AUTOMOTIVE MASTER MECHANICS have found chip problems with tunnel-type machines for broaching cylinder blocks and heads. They feel that a horizontally stroking broach with the teeth on the vertical face of the tool will enable chips to get out freely and avoid work-location problems. Also, scratches on the gasket faces can't be tolerated with high-compression engines, so the newer design of machine will prove valuable in locating a broach tooth that is giving trouble.

Diamond Dilemma

MANY CONFLICTING REPORTS are being expressed on silicon-carbide vs diamond wheels for grinding carbides. You've seen several reports in *AM*. One automotive engineer tried SiC wheels for finish-sharpening milling cutters, but found that face mills so sharpened wouldn't give desired surface finish on parts. A carbide engineer, on the other hand, says that with correct procedure SiC wheels are usually good enough. The exact answer seems to hinge on procedure, required smoothness of cutting edge, quantity of tools sharpened daily, operator training and supervision, and desired tool life. In any case, all the publicity will have a salutary effect in conserving bort and making users conscious of such wasteful practices as dry grinding with diamond wheels and disregarding recommendations of both wheel and tool suppliers. If we can add 10% to wheel life, it would be roughly like adding 900,000 carats to our annual supply, based on last year's imports of 9 million carats.

Two-Story Die

AN UNUSUAL DIE we saw recently punches slugs, then installs them in a rotor in the same stroke. The job is to insert tiny steel pellets into a copper plate. This was formerly done by locating and inserting each by hand. Now the punched plate is slipped into a slot in the bottom part of the die and indexed exactly. The punches come down, punching slugs from the iron strip above and stacking them into the non-tapered clearance below the die. When this clearance fills, each time a new slug is added at the top of the stack by the punch stroke, the bottom one is forced into the disk.

Retarded Development

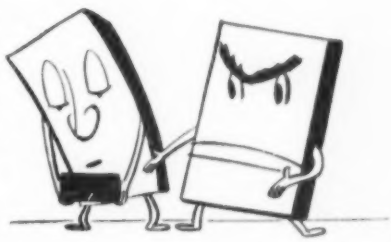
SOLUTION HEAT-TREATMENT of most aluminum alloys results in an unstable condition from which the metal age-hardens to its final stable condition; in some cases it takes only a couple of hours to reach the final state. When machining is required after heat-treament, it should be done immediately. At the Grafton plant of Wyman-Gordon, scheduling problems between heat-treating and machining departments have been simplified considerably by placing a large wooden box packed with solid CO_2 at the furnace exit. When a batch of parts in an age-hardening alloy is put through the furnace, they are loaded in the box until they can be machined. Retards the hardening effectively for several hours.

Local Hard Spot

LOCALIZED HARDENING of cast-iron parts by induction heating and quenching looks promising. Look for applications like valve seats, to do away with inserts, and other uses where a hard, wear-resistant surface is needed. But be sure that the metal is uniform in thickness to avoid "burn-throughs."

Carbide Damper

FOR PRECISION BORING, where the overhang is excessive and the bar is not supportable in a bushing plate close to the work, automotive people find a solid carbide bar has rigidity not possessed by steel. And further to cut down any chatter from vibration, a "damped" boring bar is being tried (construction like the damped quill described in *AM*—May 6, 1948). Obviously, because of the expense of these boring bars, it is advisable to use stop blocks to prevent infeed of the bars if the work has not indexed properly into position.



Wait Up

IN DESIGNING automation devices, be sure that one device, say a shuttle, will not have to wait too long, while another device, say a turnover, is getting clear. Or you may find that 12 to 15 sec are lost unnecessarily.

News of Metalworking

EXTEND SUSPENSION OF COPPER TARIFF

WASHINGTON—President Eisenhower has signed an order extending suspension of the 2¢-per-lb tariff on copper to June 30, 1954. The new act provides for return of the tariff if domestic prices drop below 24¢ per lb.

Present 24½¢ ceiling will be removed within the month. Experts anticipate a 5 to 9¢-per-lb price hike; foreign copper prices to drop to domestic levels.

Smaller brass and bronze ingot manufacturers want allocations continued for another month or two to see how high prices will go, how much copper will become available. Some Defense Dept officials agree with this, may keep allocations until June.

ABC COUNTRIES DISCUSS LIMITS AND FITS

NEW YORK—Delegates from US, Britain and Canada met here Feb 9-10 to iron out differences in terminology between the three nations in describing limits and fits. Purpose of the conference, requested by Office of Defense Mobilization, is to find ways and means of making drawings and directions mutually understandable to metalworkers in the three countries, not to impose arbitrary rules on manufacturers.

Defense Budget Cuts: Prelude To Arms Production Stretch-Out?

WASHINGTON—Charles E Wilson and his top aides are going over the defense budget with an eye to paring the $41 billion asked for this year. The Defense Secretary isn't sure just yet where he can cut, but it's an odds-on bet military funds will be slashed. All this could add up to another stretch-out for arms production.

Deputy Secretary Roger M Kyes has the job of cutting the $20 billion in new procurement requests. The military claims it can't be touched, claiming this year's request is the tightest ever submitted. If a reduction is made, they say, weapons production programs will suffer. Wilson and Kyes have nevertheless ordered service secretaries to recommend where their programs can be shaved.

One budget official figures it's possible to cut $3-5 billion from procurement without ill effects, but that amount of purchases would have to be tacked on to the end of the current arms program (about 1955), making it necessary to contract two extra years.

This is already being done on some programs—tanks for example. Danger in production stretch-out is that many manufacturers tend to shy away from defense work and unit costs zoom upwards.

That's the reason defense chiefs caution against stretching out—considering the long run, it erodes the production base, ups costs.

Military chiefs claim they're caught in a two-way squeeze—Congress won't believe the $60 billion backlog of funds is already spent, even if the checks haven't been written—on the other hand, campaign promises to balance the budget and cut taxes will force defense cuts. The military fears economy-minded Congressional zealots could just about ruin the defense buildup.

Undoubtedly, the cuts will be in contracts calling for production of soon-to-be-obsolete weapons and weapons that are already stockpiled high. Even so, there's little chance of paring more than $3 billion without cutting into the bulk of procurement—planes, heavy ordnance and electronic equipment.

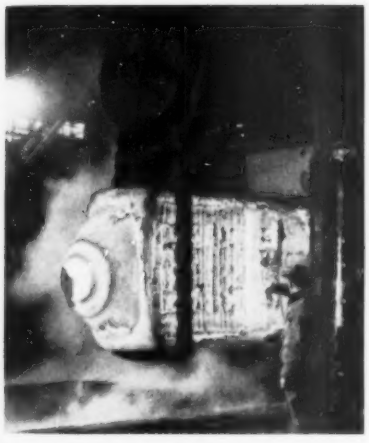
Notable exception is ammunition. Production is still not up to par and won't be for several months. Ammunition production facilities were the only blanket exceptions to last month's Defense Dept order freezing construction less than 20% complete at time of the order.

Forging a 275-Ton Ingot for Air Force's

Making the world's longest (110 ft) forging, one of 18 column laminations for a 50,000-ton Loewy die forging press for aircraft parts, at Bethlehem Steel:

Round corrugated ingot weighing 275 tons (Fig 1) is heated in a 37-ft furnace, then carried by special cranes to a 7500-ton press (Fig 2) for elongation. Process is repeated five times (Fig 3) until desired dimensions (110 ft long, 16-in. thick, 44-in. wide at body, 100-in. at ends, weight 145 tons) are achieved. As forging's length exceeds that of furnace, one end is heated and worked at a time. Forging completed, column section undergoes a two-week heat treatment in a 120-ft furnace, then is carried on three railway cars to a 6500-ton press (Fig 4) for final straightening.

1 Crane has just lifted 275-ton ingot from mold. Specially-rigged railroad car will carry it to forge.



2 Second day of forging. The once-round ingot is now rectangular and is being elongated.

No Hurry to Revise Taft-Hartley Is Capitol Hill Attitude

WASHINGTON—Revising the Taft-Hartley Labor Law is taking even longer than expected. It is doubtful now that any amendments will get through Congress before T-H's sixth birthday on June 27. There is even talk revisions won't be completed until the next session of Congress, if then.

• **The reasons**—There are many, but they all boil down to this—nobody is in any real hurry to patch up the revised Wagner Act.

President Eisenhower is leaving the job pretty much up to Congress and Republicans don't see why they should break their necks to change a law they think is pretty good as is. Democrats and labor don't have their hearts in revision; they know they won't be satisfied in the end. They still harbor faint hopes of ultimate repeal and chances of this will be better later if the law is not revised now.

Even so, employers should figure on a revised law from this session of Congress, probably in mid-summer. Basic principles will be kept. These are:

- Prevention of unfair labor practices by unions and employers.
- Union responsibility under contracts.
- Free speech for employers.
- Protection of employee rights.
- Government injunctions against unfair labor practices.
- Closed shop ban.
- Injunctions for preventing "national emergency" strikes.

Non-communist affidavits from union officials will be counterbalanced by employer affidavits or canceled entirely.

Congress will turn a deaf ear to extremists on both sides and will not listen to those advocating restriction of industry-wide bargaining. Nor will it kill the injunction, restore closed shop or make other major changes advocated by labor leaders.

Jacob D Cox, Cleveland Twist Drill Board Chairman, Dies

CLEVELAND—Jacob Dolson Cox, Jr, 71, philanthropist and chairman of the board of Cleveland Twist Drill Co, died here February 16. Son of the company's founder, Mr Cox served as president from 1919 to 1952, when he became chairman. He pioneered profit sharing and employee stock participation at Cleveland Twist Drill Co and devoted much of his income to concealed philanthropies.

Metalworking Abroad

(By McGraw-Hill World News)

Muddled US procurement orders are being protested by Japanese metal-working industries. Cited is the case of Hitachi Heavy Machinery Co, which went heavily into the red recently because its contract with the US Forces' Japan Procurement Agency proved defective. Hitachi claims US failure to divulge details of its procurement order plan kept the company from mapping out a production plan in advance, resulting in financial loss.

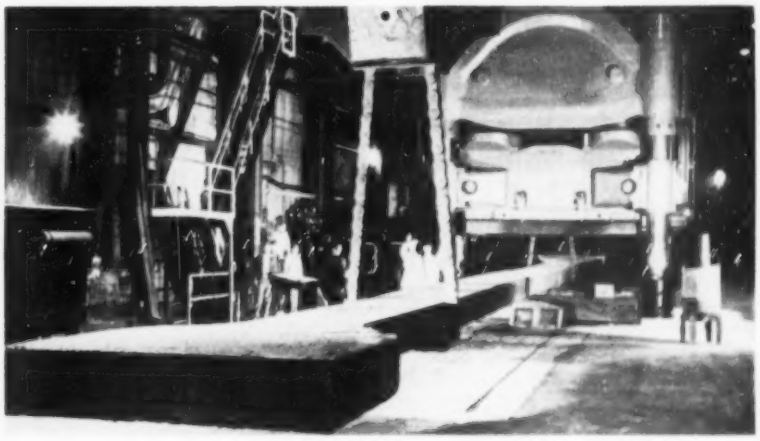
South Africa upped its machine tool and plant inventory by $300 million between 1945 and 1950, preliminary South African Census figures reveal. Total inventory, exclusive of mining machinery, is around $557 million, $450 million private capital's.

Australian auto output is picking up. Several Australian assembly plants have re-engaged laid-off workers, and British automotive manufacturers who postponed or canceled Australian expansion plans are reconsidering. Among these is England's Leyland Motors, which plans to build a heavy truck plant in Australia, contingent on repeal of severe road taxes. No repeal, no plant, says Leyland.

Bostick will open a staple machine manufacturing plant in Puerto Rico shortly. The company will invest about $150,000 in machine tools and equipment.

Heavy Press Program at Bethlehem Steel

3 Fourth heat under press. Column is now 70 ft long. Main body width is being reduced to 44 in.



4 Completely forged, the 110-ft piece gets a final straightening in a 6500-ton press. Next year, it will be assembled at North Grafton, Mass., as part of a 50,000-ton die forging press, largest of its kind.

Business Items

Parmenter-Townsend Co, Ltd, has been formed jointly by **Townsend Co,** New Brighton, Pa., and Canada's **Parmenter & Bullock Mfg Co,** Gananoque, Ont, to facilitate exchange of products, machines and methods between the two parent companies. Townsend makes industrial fasteners, while P & B makes rivets and riveting machines.

Franklin Railway Supply Co and **Bower Roller Bearing Co,** both of Detroit, are teaming their manufacturing resources to produce freight car roller bearings. Franklin makes locomotive journal lubricating equipment; Bower makes tapered and straight roller bearings. Under the new agreement, Franklin's subsidiary, **Franklin Balmar Corp,** Baltimore, will manufacture and sell freight car journal boxes using Bower bearings.

Detroit Harvester Co has purchased **Pioneer Pump & Mfg Co,** Detroit producer of coolant and lubrication pumps for machine tools. Purchase is in line with Detroit Harvester's move to expand and diversify its manufacturing — which already includes auto parts and equipment, farm mowers and sweepers.

Gear Grinding Machine Co, Detroit, has been purchased by a group of New York businessmen, headed by F W Richmond, who becomes board chairman of the company. Location and business will remain the same, except that it will be incorporated in Delaware.

Buick Motor Div, GMC, has begun assembly of Wright J-65 Sapphire jet engines at its new Willow Springs, Ill., plant.

Hy-Pro Tool Co, Detroit, has changed its Detroit address to 10428 W McNichols Rd.

Girdler Corp, Louisville, and **National Cylinder Gas Co,** Chicago, are merging for greater diversity of products. NCG produces welding and cutting equipment; Girdler makes processing equipment for the chemical, food and textile industries and high-frequency induction equipment. The two companies are joint owners of **Tube Turns, Inc,** makers of seamless welding fittings.

When CMP Goes—What Then? Capehart Bill Offers Solution

WASHINGTON — Congress is seeking a basic defense production law to succeed the Controlled Materials Plan, due to expire June 30. Most likely candidate is Sen Homer Capehart's omnibus mobilization bill, now in hearing before the Senate Banking Committee.

• **Broad Presidential powers** — Under provisions of the Capehart Bill, the President would have authority to establish priorities and make allocations, to requisition and condemn property, and to control prices, wages, rents and credit.

• **Prices and wages** — Passage of this part of the bill is doubtful. President Eisenhower has stated that he does not want authority to control wages and prices.

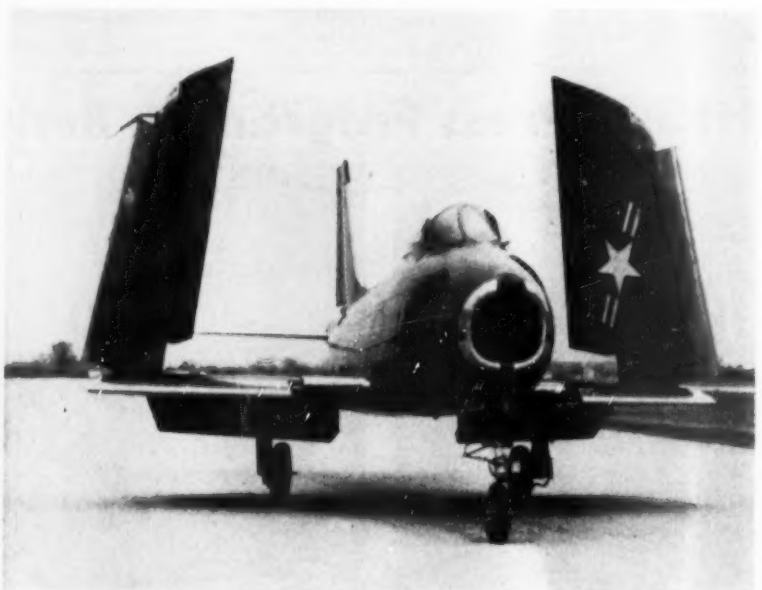
• **Allocations and priorities** — Passage of this provision is almost assured, since it has Presidential approval. Best guess on how such a system would work out after June 30: priorities would be issued defense contractors for steel, copper and aluminum — with other industries scrambling for remaining supplies of these metals.

• **Current controls** — Meanwhile, ODM has "opened" the Controlled Materials Plan pending its expiration. Consumers can now buy steel, copper and aluminum in excess of their first and second quarter allotments. Mills can now sell to any customer, if their CMP orders have been filled. Consumers wanting extra metal for March or April delivery can place orders immediately. For May delivery, consumers must wait until March 15, when lead time for regular CMP orders expires.

• **Metal situation** — Washington doesn't expect an immediate scramble for steel, copper, aluminum.

• **Steel and Aluminum**—Mills are booked through the second quarter but consumers can cash in on new capacity after March.

• **Copper** — Effect of relaxation will be slight for time being. Here's the rub: copper alloy product controls are loosened, but priorities are going to brass mills, wire mills and copper foundries with CMP contracts. National Production Authority expects to continue copper allocations for at least two months.



NAVY'S NEW FJ-2 FURY. Built by North American Aviation, this swept wing, carrier-based jet fighter attains speeds in excess of 650 mph, carries four 20-millimeter cannon

Induction Heating Branching Into Many Metalworking Fields

CLEVELAND—Recent developments have greatly broadened use of induction and dielectric heating equipment, Harry B Osborn, technical director said here at the opening of Tocco Div, Ohio Crankshaft Co's $6 million plant.

In 1936, he said, the division's entire output was devoted to induction heating equipment for surface hardening of steel parts. During 1952, this equipment made up only 8% of total equipment sold. Balance was equipment for brazing, annealing, heat treating, welding, hot forming and other new uses.

Induction heating for continuous butt-welding of pipe and tubing is growing rapidly, Dr Osborn says. It is already being applied to butt-welding of 20-in. OD steel pipe with ⅞-in. walls. Now under development is a unit to form and butt-weld tubing from aluminum alloy sheet and strip.

Induction heating of metals for jet-engine parts has grown rapidly, as has use of 60-cycle equipment for heating non-ferrous sections for hot forming. In hot forming of steel parts, 60-cycle equipment is being used to preheat billets. Continuous heating of steel rod and bar stock for continuous hot forging and upsetting is also a coming field, according to Dr Osborn.

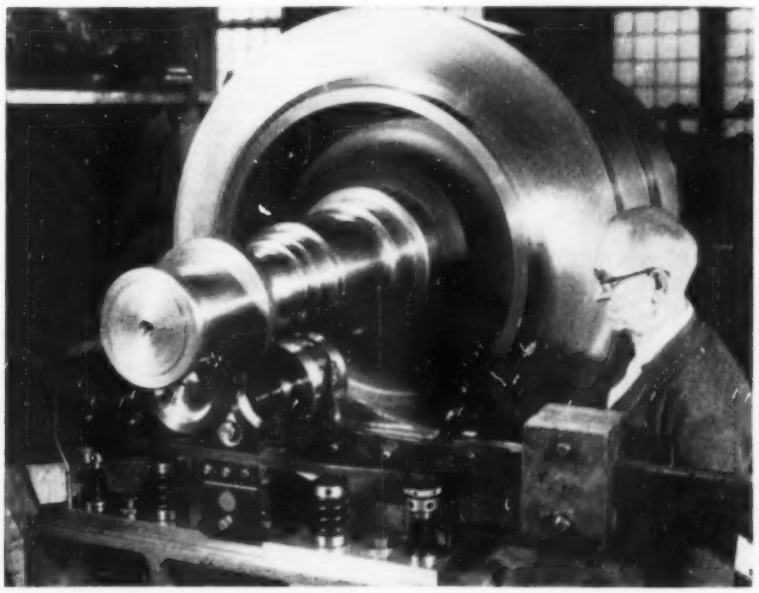
Experimental work may shortly result in applying induction heating to surface hardening of gasoline and diesel engine cylinders, eliminating hardened liners.

Induction has been tried experimentally for hot machinery, but Dr Osborn believes its future is "not brilliant"—too many variables. But for ultrasonic cleaning of metals, high-frequency power may show real value.

Another promising development is use of induction-heated steel bars for descaling, he said.

Errata

The "type lice" had a field day in the Feb 16 issue, transposing not one, but two, sets of captions. Captions for high-speed miller on pp 199 and the thread roller on pp 201 were confused. Our apologies also to Messrs Wendell B Lund of Lund Mfg Co and H J Zilske of Hydraulic Press Mfg Co, whose photo captions were switched on pp 205.



DYNAMIC BALANCING OF A ROTOR, part of world's largest multi-stage centrifugal compressor built for 100 psi discharge pressures. Built by Clark Bros Co, Olean, N Y, compressors are rated at 100,000 cfm

Plant Expansion

Thompson Products, Inc, will install facilities at its Euclid, Ohio, plant for testing Navy aircraft pumps and turbine drive assemblies under altitude conditions approximating those up to 80,000 ft. Total cost of the project is estimated at $1.25 million.

Firestone Tire & Rubber Co will shortly reopen its New Bedford, Mass., plant for the manufacture of 150 mm shells under a $10.9 million Army contract covering plant conversion and retooling. The plant, closed since 1947, was formerly used to manufacture tire cord fabrics.

Torrington Manufacturing Co, Torrington, Conn, recently opened a major addition to its fan and blower manufacturing plant.

Foxboro Co, Ltd, Montreal, has doubled its Canadian instrument manufacturing facilities by adding a 28,000 sq ft building to its Montreal plant.

American Can Co plans to expand its North Chicago, Ill, machine shop in the near future.

American Steel Foundries is adding four heat treating buildings to its Chicago armor plate plant.

American Gage & Machine Co's Simpson Div is adding a 30,000 sq ft two-story building to its Chicago plant.

Lind-Hog Machinery Co, Chicago, will shortly begin construction on a 3,000 sq ft addition to its plant.

Fabricast Div, GMC, has recently awarded contracts for constructing a 100,000 sq ft permanent mold casting plant at Jones Mills, Ark.

John Hassall, Inc, Brooklyn, N Y, is beginning construction on a new plant at Westbury, L I, N Y. The 102-year-old manufacturer of fastening devices will move to the new location this summer, after having occupied its Brooklyn location for some 65 years.

Trailmobile, Inc, has received approval from its parent company, Pullman, Inc, to modernize its production facilities at Cincinnati and to build four new factory branches in various sections of the country.

FORK TRUCKS NOT STRATEGIC OK FOR REDS: BRITISH

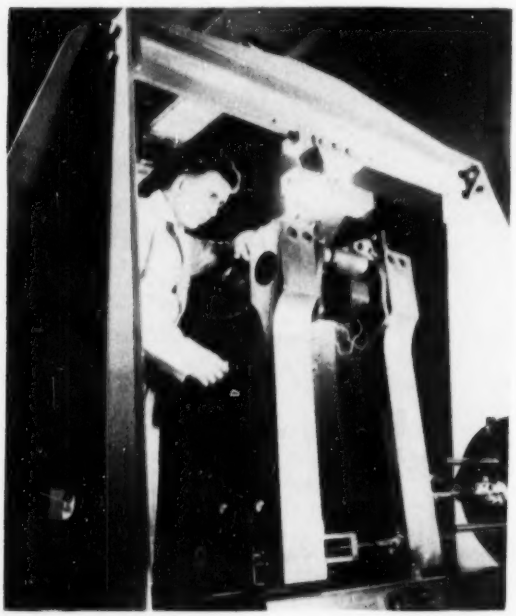
LONDON—Britain's Board of Trade recently ruled that fork-lift trucks are not strategic goods, thereby okaying Red China's $1.4 million order of last September, largest single export order for mechanical handling equipment in British history.

Early in February, $280,000 worth of fork trucks, first of the shipment, left for China. Although some MSA officials view this as a violation of the US Battle Act, to date MSA has neither upheld nor vetoed the decision handed down by the British Board of Trade.

UAW To Test Weekly Charity Deduction Plan at Willys-Overland

TOLEDO—Some 8000 of the CIO-UAW workers at Willys-Overland's plant here have signed cards agreeing to a deduction of 25 cents per week from their wages, the money to go into a charity fund to be administered by a joint labor-management committee. Later if the plan works out, it will be expanded to include all Toledo plants employing UAW labor, involving up to 50,000 employees.

The plan provides that not more than 25 per cent of its annual funds shall go to any one agency, a direct slap at Toledo's Community Fund, a frequent target of UAW criticism. Under the new plan, the Community Fund must come to UAW for donations, giving UAW a greater voice in its administration. In spite of this, the Community Fund stands to benefit more than in previous years, since the $10 to $13 collected from workers under the UAW plan will amount to far more than the average worker usually contributes to charity, a UAW spokesman claims.



GIANT TUNING FORK, used at Chrysler Corp to test crankshafts for endurance and strength, bends auto crankshafts up to 5000 times a minute. With this unit, crankshaft undergoes years of driving punishment in just a few hours

SIX METALWORKING STANDARDS APPROVED IN '52

NEW YORK—American Standards Association approved 87 standards in 1952, six of them of particular interest to the metalworking industry, Vice Admiral George F Hussey, Jr, ASA's managing director, stated here recently. This brings total of American Standards to 1264.

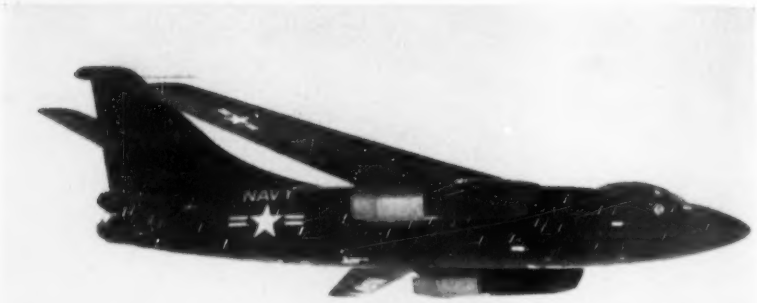
Newly approved machinery and metalworking standards include:

Physical Specimens of Surface Roughness and Lay, B46.2; Square Hexagon Bolts and Nuts, B182; Accuracy of Engine and Tool Room Lathes, B5.16; Specifications for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High Temperature Service, G38.1; Mounting Dimensions of Lubricating and Coolant Pumps for Machine Tools, B5.28; and Preferred Thicknesses for Uncoated Thin Flat Metals (under 0.250 in.), B32.1.

INTERNAL GRINDING FILM AVAILABLE

SPRINGFIELD, VT—"Alignment for Better Internal Grinding," a 30-min, sound-color film is being offered on a loan basis by Bryant Chucking Grinder Co of this city.

A semi-technical discussion of internal grinding fundamentals beamed at supervisory and management groups, the film shows examples of work finished on an automatic, semi-automatic and tool room machine — the latter to a tolerance of 20 millionths on diameter and a 2 micro-in. surface finish. Reservations for the film may be made with Advertising Dept, Bryant Chucking Grinder Co, Springfield, Vt.



NAVY'S FIRST SWEPTWING TWIN-JET ATTACK BOMBER, the A3D, takes to the air at Edwards Air Force Base, Calif. Designed by Douglas, the A3D can take off from either carriers or airstrips, performs in the 600-700 mph class, will fly above 40,000 ft on combat missions

Machine Mfrs Spent $500 Million On Research in '51: Survey Shows

WASHINGTON — Machinery makers, including manufacturers of electrical and electronic equipment, spent more than a fourth of the total national expenditure for product research and development in 1951, a Department of Defense-Bureau of Labor Statistics survey shows.

Of the machinery industry's $500-plus million, over $430 million was spent by electrical machinery manufacturers alone. Other components of the machine industry spent $100 million on development. Metal fabricators accounted for $38 million expenditures.

The government financed about 25% of the machinery industry's outlay, 30% of the money spent on metal fabricating research. Electrical machinery industry, topping the 1951 list with its $430 million program, ranked only behind the aircraft and professional-and-scientific instrument fields in federal support. Government money financed about 57% of its outlay.

•**Outlay per research employee:** Both the machinery and metal fabricating industries ranked slightly below the all-industry average of expenditure - per - research-employee. Machinery industry (12,000 research workers) spent $8100 per employee: metal fabricating industry (2500 researchers), $8000 per employee.

•**Research employee turnover:** machinery industry showed an average turnover of 17.4 research employees per 100 in 1951, seven going into military service. Fabricated metal products industry turned over 15.8 workers per 100, losing just about two-per-hundred through military call-ups, the survey reports.

Foresee 'Mad Scramble' for Young Engineers

NEW YORK—This year's competition for college engineering graduates will be a "mad scramble," even more hectic than last year's, a poll of top executives of 195 leading companies, made by the National Industrial Conference Board recently, shows.

Here is why:

• **Fewer are graduating.** There are more underclassmen but fewer upperclassmen this year.

• **Military Service.** Only 25% of male engineering seniors have completed their military tours.

• **More companies are recruiting.** Not only is the number greater this year—each has a larger quota of engineers to fill.

Salaries offered are on the increase. Manufacturing companies are starting their engineers at an average monthly wage of $334, contrasted with $309 for last year. Other graduates are being offered: $308 (regular AB's), $370 (MA's), $488 (PhD's). Non-manufacturing firms are offering $321 to engineers, AB's $271; MA's $312, PhD's same as manufacturers.

Distributors Named

AM Castle & Co recently opened a new steel warehouse at 2500 N Main St, Rockford, Ill. The warehouse is one of the most completely stocked and equipped in the country for a city of comparable size.

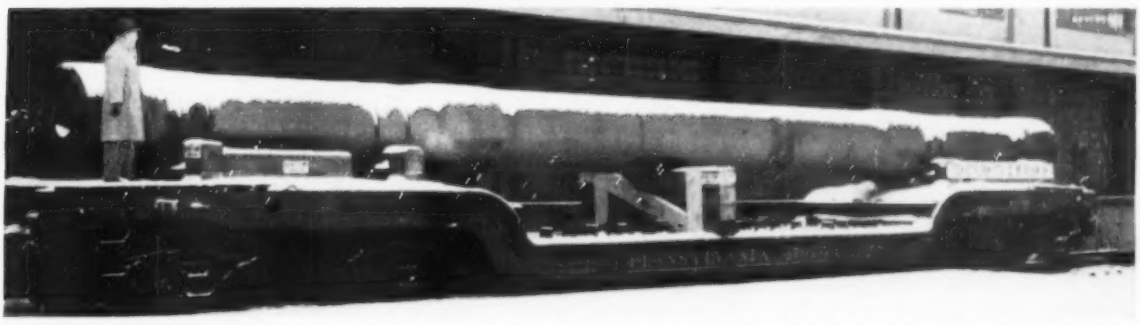
W D Vanderipe & Associates, representative for Automatic Transportation Co's line of industrial trucks, has moved its offices to 2421 Middle Rd, Davenport, Iowa.

Quint-Alloy Corp, Dearborn, Mich, will handle Adamas Carbide Corp's new $250,000 stock of standard tungsten carbide recently set up at Dearborn. Teletype service will be maintained at Quint-Alloy to facilitate deliveries to Adamas Carbide's Michigan customers.

Vanadium Alloys Steel Co, Latrobe, Pa, has opened a warehouse in Chicago at 6632 W Diversey Ave, enabling the company to carry a more complete stock of Vasco tool steel grades.

Tidewater Supply Co, Norfolk, Va, has been named distributor for American SIP Corp products in North Carolina, South Carolina and most of Virginia. Named as Georgia distributor is the **Noland Co, Inc,** Atlanta.

E H Kliebenstein Co, Ridgefield, N J, and **Diesel Engineering & Equipment Co,** Fords, N J, have been appointed exclusive factory - approved dealers for General Motors Series 71 diesel engines, generator sets and parts. Kliebenstein will serve Bergen, Passaic and Hudson counties; Diesel Engineering & Equipment Co, Monmouth and Middlesex counties, N J.



GIANT 152-TON TIE ROD, one of 12 to be used on 35,000 and 25,000 ton closed-die forging presses being built by E W Bliss Co as part of the Air Force Heavy Press Program. Forged from a 250-ton billet by Bethlehem Steel, rod is shown outside the Bliss plant at Canton, Ohio, awaiting final machining. Rod is 70 ft long, has a maximum diameter of 47 in.; 18-in. hole is bored throughout its entire length. When completed, presses will be installed at Kaiser Aluminum & Chemical's Newark, Ohio, Works, where they will be used to press out military aircraft components

Joseph Horton

W N Hall

Matthew J Betley

D Rumsey Plumb

Names in the News

Joseph Horton has been named superintendent of Pastushin Aviation Corp's No 3 plant at Hawthorne, Calif. He comes to Pastushin from Aviation Maintenance Corp, where he headed the company's Air Transport Command Div. Also new to Pastushin's staff is **Herbert Trautmann,** appointed research and development engineer. He was formerly president of Cal-Pan Corp, Alhambra, Calif.

George F Schroeder, project supervisor at Ford Instrument Co, Div of Sperry Corp, Long Island City, NY, has been promoted to the post of acting assistant chief engineer, airborne equipment.

Harry N How, president of Western Machinery Co, San Francisco, was recently elected chairman of the board. He is succeeded as president and general manager by his son, **Jack H How.**

Will W Sawdon, formerly with Wright Aeronautical Corp, has been appointed assistant general superintendent of Hudson Motor Car Co's Wright Aeronautical manufacturing operations.

John D Harby has been named superintendent of instrument engineering, and **J Donald Dutcher** superintendent of instrument manufacturing for Bausch & Lomb Optical Co, Rochester, N Y. Annapolis graduate Harby has been with B & L since 1939 and was formerly in charge of instrument engineering and inspection. Mr Dutcher has been with the company since 1936 and was formerly superintendent of assembly.

W N Hall, formerly assistant superintendent, has been named superintendent of Temco Aircraft Corp's plant at Dallas and will be in charge of 15 production departments. Heading Temco's night operations as superintendent is **Herman Muller,** former assistant superintendent. Also promoted by Temco recently is **Walton M Dallas,** to be manager of manufacturing control. He will be assisted by **Robert L Lewis.**

Matthew J Betley has been elected vice president, manufacturing, and **George J Fischer** vice president, sales, for Aeroquip Corp, Jackson, Mich. Mr Betley was formerly works manager and Mr Fischer general sales manager.

Langdon M Phillips, formerly field sales manager, has been appointed assistant sales manager for Rodney Hunt Machine Co.

John O Almen, SAE Manly Memorial Medalist and recipient of the AGMA's 1946 Connell Award, has joined Western Gear Works, Lynwood, Calif, as engineering and research consultant. Mr Almen was with General Motors, Detroit, as research consultant for 26 years. During that period, he was responsible for development of many innovations in automotive gearing.

Robert B Taggart, formerly executive engineer for Watson Flagg Machine Co, Paterson, N J, has joined New York Air Brake Co's Watertown, N Y, Div as chief industrial engineer. He will be responsible for tool engineering, methods, timestudy and related activities.

D Rumsey Plumb recently succeeded his father. **Fayette R Plumb,** to the presidency of Philadelphia's famous 97-year-old hardware firm, Fayette R Plumb, Inc. Rumsey Plumb is the third generation to head the firm. Other officers of the firm elected in January: **Frank L Campbell,** executive vice president and sales manager; **Frank P Green,** vice president and merchandise director; **Calvin P Bascom,** vice president and general manager, St Louis plant; **William D Plumb,** secretary-treasurer; **George R Beck,** assistant secretary.

J J Demuth, engineering consultant for Ehrhardt Tool & Machine Co, St Louis, has been named consultant to the Tool, Die, Jig and Fixture section, Metalworking Equipment Div, NPA. He will devote three days a week to his new duties. Mr Demuth, past president of ASTE, replaces **Ross Adams,** now with Fellows Gear Shaper Co, Springfield, Vt.

Paul F Lambert, former chief inspector at Chrysler Corp's Kercheval plant, has been named general chief inspector of Chrysler's Jefferson and Kercheval plants. He is succeeded at Kercheval by **William Lewis,** who in turn is succeeded as assistant chief, car building division, by **Allan C Lewis.**

T F Boyle, assistant to the district engineer at Bethlehem Pacific Coast Steel Corp's Fabricated Steel Construction Div, Alameda Works, has been appointed works engineer.

Milo F McCammon has been appointed director of manufacturing of Bendix Aviation Corp's Eclipse-Pioneer Div, Teterboro, N J, where he will be in charge of production of generators, automatic pilot systems, and aircraft instruments.

Clifford D Dernier

A L West

Andrew M Toft

Arthur F Erwin

Names in the News

Clifford D Dernier has been named general superintendent, in charge of all manufacturing operations for GM's Cadillac Motor Car Div Cleveland Tank Plant. Mr Dernier, who has been with GM since 1917 and was formerly assistant general superintendent for tank production, succeeds **Harold G Warner,** who has been given an executive manufacturing assignment at Cadillac's Detroit plant.

Ernest L Black has been named manager and **John P Selberg** chief engineer of Borg-Warner Corp's newly-formed Petro-Mechanics Research Div, Chicago. Mr Black comes to Borg-Warner from Pacific Airmotive Corp, where he was acting manager of its manufacturing division. Mr Selberg has been with IDECO-Torrance Div, Dresser Equipment Co, as chief engineer.

Robert H Lucas, chief engineer of US Steel's Michigan Limestone Div, has been appointed assistant to the president of US Steel's Pittsburgh Steamship Div.

H M Williams and **E W Ruhe** have been named equipment engineer and mechanical projects engineer, respectively, for Olin Industries' Metals Div, East Alton, Ill. Mr Williams was formerly superintendent of the Division's maintenance department. Mr Ruhe chief mechanical engineer.

John J Fluck has been appointed general manager of North American Aviation, Inc's Fresno, Calif, plant. He succeeds **L S Wait,** who has been named assistant to Vice President A T Burton at the Los Angeles plant.

A L West, assistant treasurer, has been elected treasurer of Clearing Machine Corp, Chicago.

Andrew M Toft, formerly vice-president and general manager of Cans, Inc, has been named vice-president in charge of manufacturing and engineering for National Can Co, which acquired Cans, Inc, last December.

E J Dalton was recently elected president of Yates-American Machine Co, Beloit, Wis, succeeding **W D Johnson,** who resigned recently. Mr Dalton is also chairman and chief executive officer.

Arthur F Erwin and **Edward F Brill** have been appointed manager and chief engineer, respectively, of Allis-Chalmers Mfg Co's Atomic Power Section. Mr Erwin was formerly assistant manager of the section; Mr Brill, engineer-in-charge.

Stanley C Stone has been named superintendent of Eldorado Tool & Mfg Corp, Milford, Conn. In addition to his shop responsibilities, he will develop and engineer improved deep-hole drilling techniques. He was for 12 years production engineer for American Bosch Corp.

Robert A Welch, formerly master mechanic at Saco-Lowell's Sanford Div, has resigned to become factory manager for Rayton Corp, Lansdale, Pa, succeeding **J Edward Olson.**

OBITUARIES

Charles A Booth, 76, executive vice president, Buffalo Forge Co, Buffalo, N Y, died in that city recently following a short illness. Mr Booth began his career with Buffalo Forge in 1900. He was a past president of National Assn of Fan Mfrs.

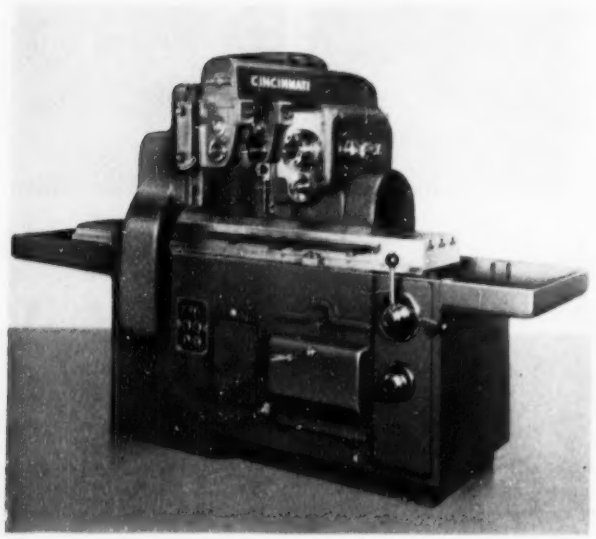
Samuel Koffsky, for 16 years chief engineer, Simmons Machine Tool Corp, Albany, N Y, died in that city January 15. Following graduation from Rensselaer Polytechnic Institute in 1923, Mr Koffsky was for several years a bridge designer, nelping to design the Peace Bridge over the Niagara River, among others. He joined Simmons in 1936, where he later played a major role in designing machine tools for use in World War II and the current national defense program.

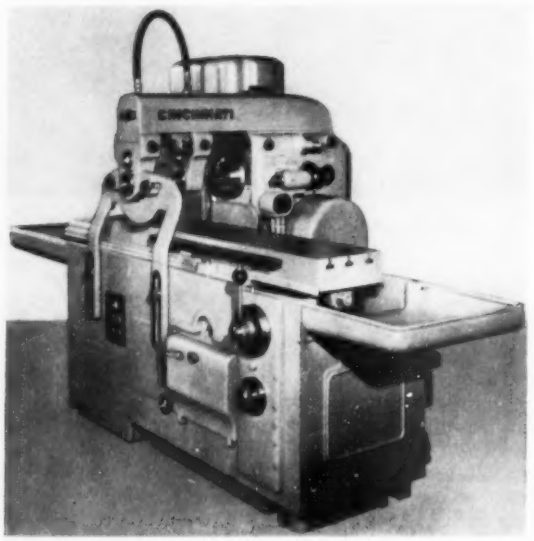
Anthony Oberholtz, 58, owner of Consolidated Tool & Products Co, Los Angeles, and Western division manager for Snap-On Tools Corp, died in Los Angeles, January 3.

Heinz E Schrader, assistant vice president, Western Gear Works, Lynwood, Calif, died February 2 following a prolonged illness. Mr Schrader joined Western Gear as a draftsman following graduation from the University of California in 1928.

Daniel Gurney, 52, vice-president and director of engineering, Marlin-Rockwell Corp, died recently. Son of the late Frederick Gurney, founder of Gurney Ball Bearing Co, forerunner of Marlin-Rockwell, he joined Marlin-Rockwell after taking graduate electrical engineering studies at MIT. Mr Gurney left M-R in 1923, returning in 1938. During this period and subsequently he designed much of the machinery used today in the manufacture of ball bearings.

New Shop Equipment





Plain automatic rise-and-fall style (left) and plain automatic style are part of new . . .

Cincinnati Line of Automatic Milling Machines

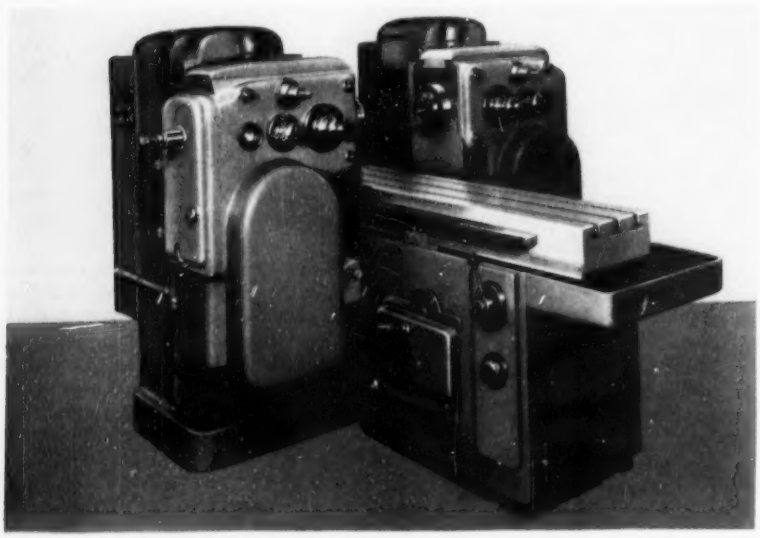
Spindle motor	3 or 5 hp
Table travel	24 in.
Rapid traverse	300 ipm
Table feed	$\frac{1}{2}$ to 20 ipm
Spindle speed	30 to 1200 rpm
Vertical feed of spindle carrier (RAF machine)	1 to 40 ipm

A new line of automatic milling machines, built in plain, duplex, and plain rise-and-fall styles, is announced by The Cincinnati Milling Machine Co. They are powered at the spindle by 3- or 5-hp motors. Standard table travel is 24 in., although longer table travel (up to 144 in.) may be obtained for long, comparatively light work.

Automaticity and manual maneuverability are said to be combined to an unusual degree for production milling machines. A single lever in the cycle selector unit initiates the complete milling operation, including automatic table cycle, automatic spindle stop, automatic backlash eliminator, automatic spindle carrier cycle of rise-and-fall machines, and automatic spindle retraction. All these automatic features can be bypassed for manual control.

An individual motor drives the spindle through V-belts and three gear contacts; 3 hp for standard speeds, and 5 hp for high spindle speeds. The spindle is quill mounted for cross adjustment. Bearings, gears, and all other parts within the spindle carrier unit are automatically lubricated by a combination circulating and splash lubrication system.

Walls of the bed are considerably wider than the table with the intervening space catching coolant and chips and directing them into a chip



Duplex automatic style in the No. 2-24 line

Materials and Parts

compartment. Table ways are automatically pressure-lubricated. Dogs are carried on the underside of a rail attached to the front of the table, where they will not be fouled with chips. Table is traversed through a conventional screw and nut arrangement powered by a separate 2-hp motor.

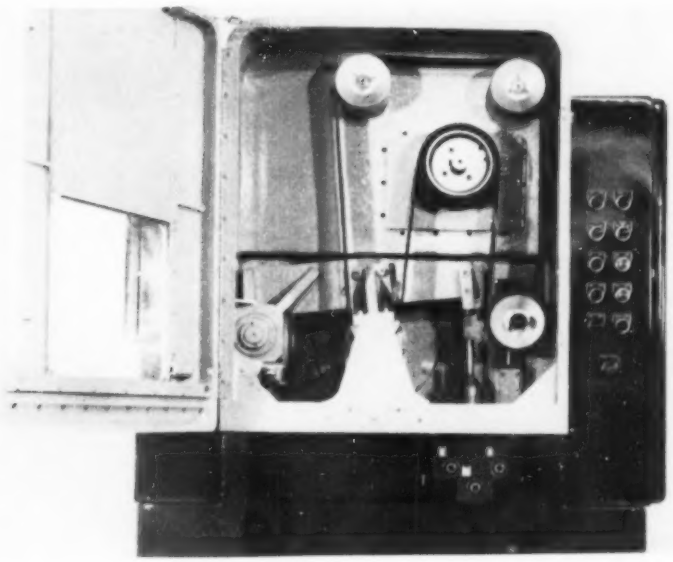
Lever for starting automatic cycle has four power manual positions: rapid traverse right and left, and feed right and left. A second lever controls vertical traverse of the spindle carrier of RAF machines. It has positions for automatic and power manual control up and down.

Sequence of automatic functions is controlled by an assembly of cams on a short demountable shaft in the bed. Cycle selectors are said to be changed in less than a minute's time and are interchangeable with those on the No. 0-8 automatic milling machine.

To further reduce the required inventory of cycle selectors, No. 2-24 machines have a table cycle reverse device. A knob extending from the front of the machine changes the direction of table feed and rapid traverse. A small external control lever indexes the cycle selector for setup.

Extra equipment includes automatic quill retraction, a cam roller attachment, high series of spindle speeds 60 to 2400 rpm, two high series of table feeds up to 80 ipm, and a low series of table feeds.

The Cincinnati Milling Machine Co, Cincinnati 9, Ohio



Planet Generating Belt Grinder Forms Jet Buckets and Blades

Buckets and blades for aircraft gas turbines are ground in a generating belt grinder developed by Planet Products Corp in cooperation with Metcut Research Associates. The development machines, built for Curtiss-Wright, are tooled for Sapphire turbine rotor and stator parts. They remove stock from one side of blades at a rate of 0.001 to 0.003 ips, so that an average cycle time of less than one minute per side can be obtained with the usual stock allowance. An 80-grit belt has been used on Nimonic forgings (about 80% nickel) to produce a finish of about 50-in. rms.

The machines are said to incor-

... INCLUDING

Dieing machine makes drawn and formed stampings from 25-in. strip. page 152

Carbide tool grinder uses principle of molecular decomposition of grinding fluid to reduce heat. page 154

Honing machine for producing optically flat surfaces to 20-in. dia now has independent control of spindle and wheel speeds. page 160

Three-wire measurement of pitch diameter is simplified by holder to position the wires. page 164

Portable hardness tester gives direct readings on the Rockwell 15N scale. page 166

Grinding attachment provides coolant and collects sludge for salvage of diamond dust. page 168

Burner for gas or oil has fuel meet air in both converging and rotating pattern for atomizing efficiency. page 170

Pedestal tool grinder shifts motor position to increase work area. page 176

... and in Mar 16

Single spindle bar machine is designed for wide range of materials, for production or limited runs.

Welding method with two small electrodes, instead of a single larger one, is said to increase speed of automatic welding by 50%.

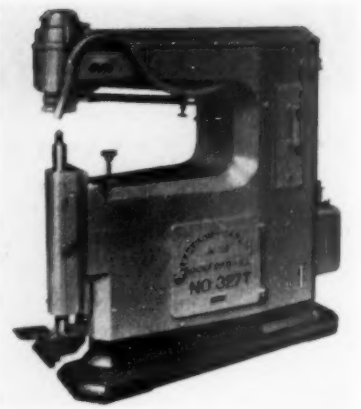
porate a new approach to conjugate form grinding using an abrasive belt traveling between a master form and the work. The master form generates the desired contour as a result of the relative motion between it and the work. Progressive contact over a limited area is made so that a 15-hp motor supplies ample power.

Master forms are generated in the machine. A master blade or bucket is placed in position on the machine, supported in the same way as in the engine when possible. A blank faced with plastic is inserted into the conjugate form position. Power sweep motion and hand feed control are used to shape the plastic to the required form. This is reproduced in steel, hardened, and surface treated or hard chrome plated to improve wear resistance.

Two models are available: Model 4S for concave shapes and Model 4T for convex and relatively flat surfaces. Reciprocation of work and cam assembly is hydraulic with pressure automatically reduced when the machines are not grinding to prevent overheating.

When work is loaded and the cycle initiated, operation is automatic until the work is ready for unloading.

Planet Products Corp, Cincinnati, Ohio

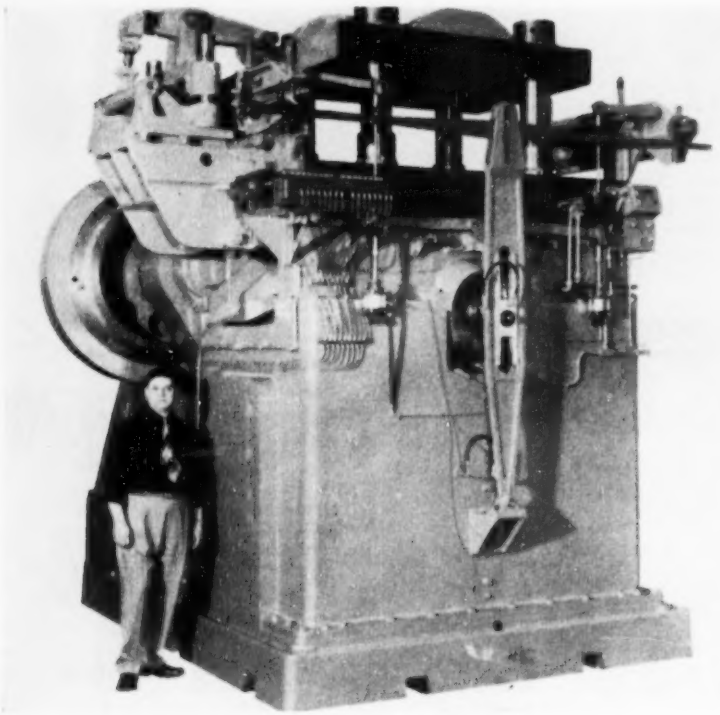


Ekstrom, Carlson Trim Router Cuts Large Non-Ferrous Sections

No. 327-T trim router was designed for the aircraft industry for trim routing large and difficult-to-handle non-ferrous sections. Spindle speeds of 10,000 and 20,000 rpm are obtained with a selector lever and a belt change. Spindle drive motors of 3, 5, or 7½ hp at 3600 rpm are optional.

Throat clearance is 27¾ in. with height from floor to guide pin holder of 32¾ in. The adjustable distance from the end of the guide pin holder to the face of the spindle ranges from 3 to 9¼ in. Spring-loaded, sliding guide pin holder provides a 6¼ in. maximum stroke, controlled by an adjustable screw-type stop.

Ekstrom, Carlson & Co, Dept M-1, 1400 Railroad Ave, Rockford, Ill



Henry & Wright Dieing Machine Handles Strip 25 Inches Wide

High-speed automatic dieing machine with 350-ton capacity takes metal up to 25 in. wide and 11/32 in. thick. It makes completely drawn and formed stampings in 13 operations by the progressive die method.

One of its first applications is to produce right- and left-hand parts for an automotive window control gear at the rate of 60 complete pairs per minute. Steps performed with each stroke of the machine—including notch, pierce for pilots, draw, bend ears, and 9 other operations—replace the zinc casting method used previously to produce the part. The material is 0.065 in. hot-rolled steel in coil form.

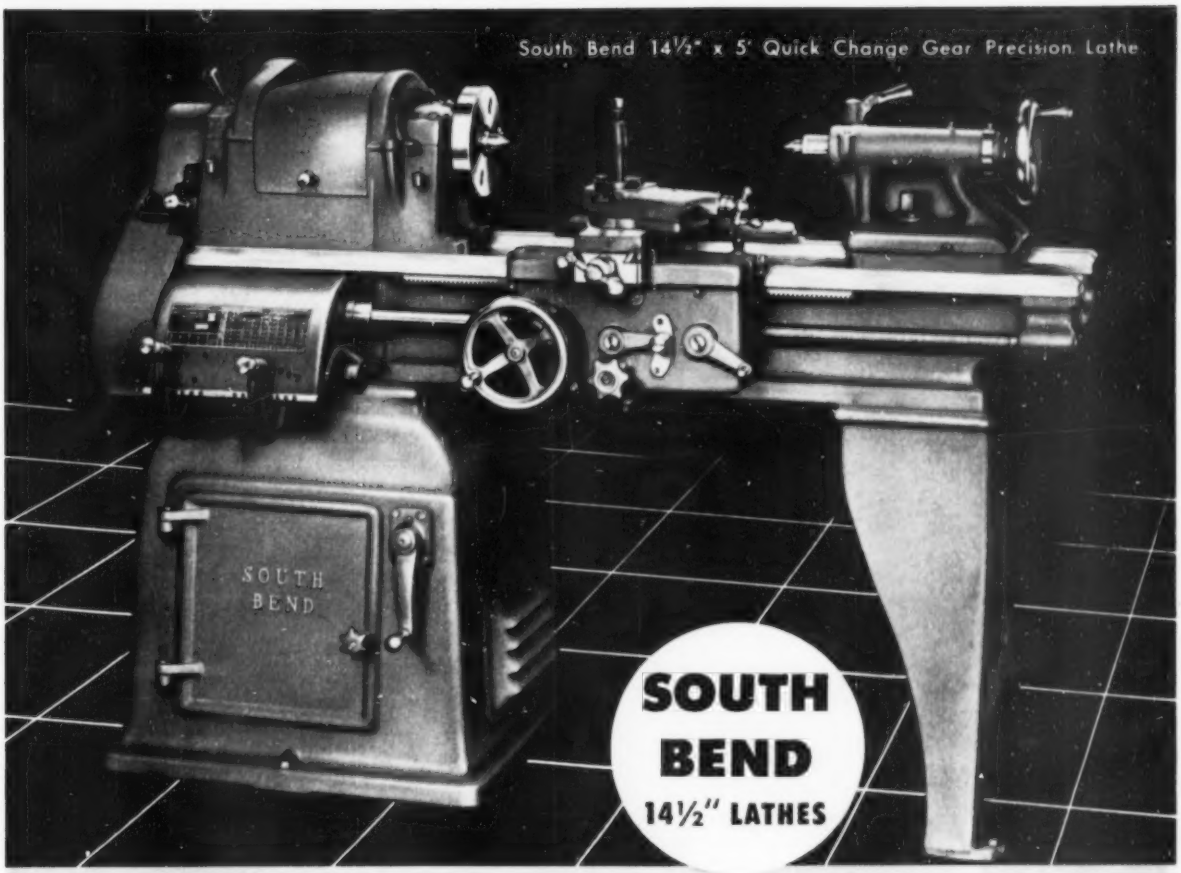
Strokes up to 60 in. can be provided for producing straight shells up to 3⅜ in. long and tapered or hemispherical shells of greater lengths. Alignment of the tools is provided by design in which angular thrust from the crankshaft and connection is absorbed by the lower cross head instead of the punch-carrying member.

Henry & Wright, Div Emhart Mfg. Co, Winsor St, Hartford, Conn

New Hermes Cutter Grinder For Engraving or Routing Cutters

Model CG2 cutter grinder has a precision ball-bearing spindle said to permit vibrationless grinding. The toolhead is designed for spring collets and has a capacity of ½-in. dia shank cutters. It is equipped with an indexing device for grinding single lip, two-, three- and four-sided cutters.

New Hermes Engraving Machine Corp, 13-19 University Place, New York 3, NY



FOR FAST, PRECISION MACHINING

SPECIFICATIONS

SWINGS: 14⅝" over bed and saddle wings; 10¼" over saddle with chip guard removed.

BED LENGTHS: 5, 6, 7 and 8 feet.

DISTANCES BETWEEN CENTERS: 24½ to 60½ inches.

MAXIMUM COLLET CAPACITY: 1 inch. (Collets interchangeable with South Bend 10"-1" Collet, 13", 16" and 16-24" Lathes.)

SPINDLE BORE: 1⅜ inches.

SPINDLE SPEEDS: Eight . . . 27 to 800 r.p.m.

POWER LONGITUDINAL FEEDS: 48 R.H. or L.H., .0015" to .0841".

POWER CROSS FEEDS: 48, .0006" to .0312".

THREAD CUTTING: 48 R.H. or L.H. pitches, 4 to 224 per inch.

CROSS SLIDE TRAVEL: 10 inches.

TAILSTOCK SET-OVER: 1-5/16 inches.

South Bend 14-1/2" Lathes offer many advantages for precision machining. Ease of operation, speed, power, accuracy, and efficiency are some of the features responsible for their popularity. Often the precision and quality of finish obtained with South Bend Lathes are such that subsequent grinding, honing, or lapping operations are unnecessary. Substantial savings in capital investment, power consumption, floor space, and labor costs have resulted from their installation.

SEND INFORMATION CHECKED:

☐ _____

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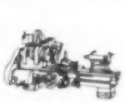
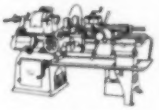

☐ 9" and 10" BENCH LATHES

☐ 10" to 16-24" FLOOR LATHES


☐ ½" and 1" Collet TURRET LATHES

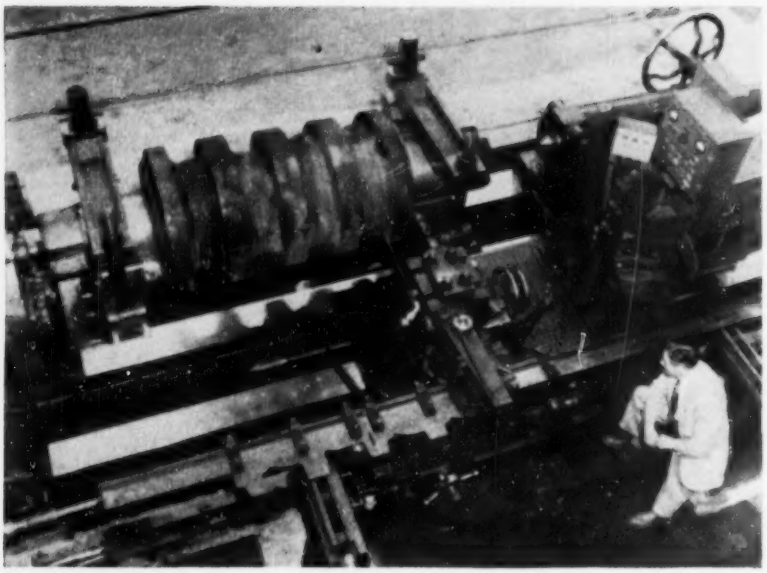
☐ 14" DRILL PRESSES

☐ 7" BENCH SHAPERS

Name _____ Company _____

Street _____ City & State _____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana



Mackintosh-Hemphill 60-Inch Lathe Turns Rolls With Electronic Duplicator

A 60-in. roll-turning lathe built by Mackintosh-Hemphill for U S Steel has all-electronic duplicating equipment to control cutting action. Push-button manual control of all motor-driven tool feeds permits fast roughing of individual passes and rapid automatic roll finishing.

The duplicating device guards the motion of the cutting tool from a flat templet whose contours are those of the roll to be machined.

A minutely varying degree of angular deflection in a floating tracer stylus moving along the templet is signaled to a control panel. These signals are amplified, interpreted, and fed to two electric motors which keep the stylus traveling along the templet. The tool is mounted on the same movable part of the lathe carriage as the stylus and follows the same path.

With carbide tools, headstock spindle speeds up to 32 rpm are available. Present practice calls for surface speeds of about 60 fpm on iron and 200 fpm on steel. A continuous chip disposal conveyor discharges into removable buckets in pits at the end of the lathe bed.

Special roll housings support the contouring rolls on their necks, as in the mill, rather than mounting them between centers. The lathe can accommodate rolls up to 54 in. in diameter and 20 ft long. Neck diameters can range from 11 to 28 in.

Mackintosh-Hemphill Co, 901 Bingham St, Pittsburgh 3, Pa

Dynatomic Carbide Tool Grinder Now Commercially Available

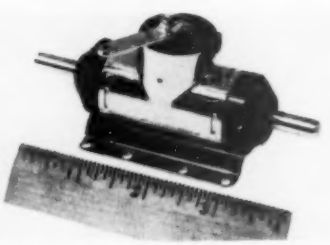
The Dynatomic grinder, in which molecular decomposition of the grinding fluid is said to reduce heat to a fraction of normal, is now being produced. The grinder was demonstrated at the last ASTE Show (*AM*—Mar 31, '52, p134). An extremely high wheel speed provides a high energy value to the abrasive particles and in conjunction with the chemical action of the fluid is said to minimize energy adsorption on work and wheel contacting surfaces.

The wheels are a special combination of abrasives and bond materials developed for Dynatomic grinders. The fluid is a derivative of Metalloid (*AM*—Feb 18, '52, p196). During grinding its molecular structure breaks down and releases nascent atoms of nitrogen, chlorine, hydrogen, and oxygen. At room temperature it is said to be chemically inert and non-toxic. Consumption of the fluid is reported slight.

Ball-bearing spindle is belt driven from a 10-hp motor. The grinding wheel is a semi-segmental ring shape grinding on the front face. A slow speed auxiliary drive motor is mounted in the base to drive the spindle at low speeds for dressing and truing.

The plain grinder mounts a tilting table on top of the knee. The universal machine includes a saddle-table unit.

The Dynatomic Corp, 7 S Dearborn St, Chicago 3, Ill



Metron Miniature Speed Changer

Variable speed changer is controlled by a lever which, through an arc of 63° provides for rapid changes of speed over a 25 to 1 range. The lever can be removed to provide a speed-control shaft in a vertical axis. Type 3B changers are completely enclosed, permanently lubricated, and equipped with ball bearings throughout.

Metron Instrument Co, 432 Lincoln St, Denver 9, Col

Mahogany cabinets for holding Size Control gage sets are available in two models. Space is provided for separate collets to fit a universal handle for each plug member in class XX, X, Y, and Z accuracies. Reversible plain sets in number, fractional, or letter sizes are complete in cases; reversible thread sets in any combination of standard sizes, National and Unified Series; reversible special sets in any combination desired.

Size Control Co, Div American Gage & Machine Co, 2500 W Washington Blvd, Chicago 12, Ill

—Robert M. Feemster, Chairman of Exec. Comm., Dow-Jones & Co., Inc.

"You can't sit on the news!"

In 1940, The Wall Street Journal circulation was 29,000. Today it's 255,000—and still climbing!

"Like any news," said Chairman Robert M. Feemster, "news of business is worthless unless it's fresh!

"We set out to make The Wall Street Journal the truly *national* business daily—one that would reach executive desks all over the country on the same morning. We first decentralized our printing plants—publishing in New York, San Francisco, Chicago and Dallas. But we still couldn't deliver fresh news from these points without the fastest, most *reliable* shipping service.

"That's why we called in Air Express.

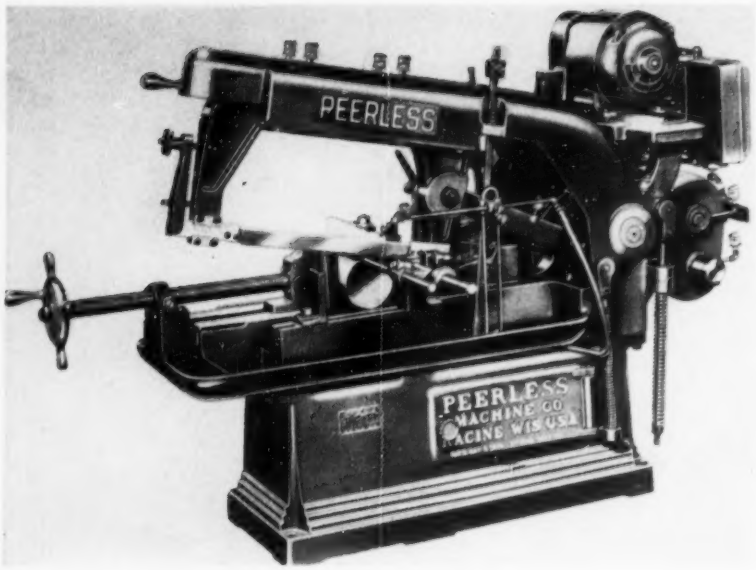
"Now, 6500 pounds of Wall Street Journals go Air Express daily. Only hours later they're in a score of other major cities. And on practically every shipment, Air Express rates are the *lowest in the field*.

"We knew we could build circulation. We knew we had the news and features vital to American business. Our problem is to deliver the papers! Air Express helps solve it! If you're building circulation or sales, look into Air Express rates and benefits."

AIR EXPRESS

GETS THERE FIRST

Division of Railway Express Agency

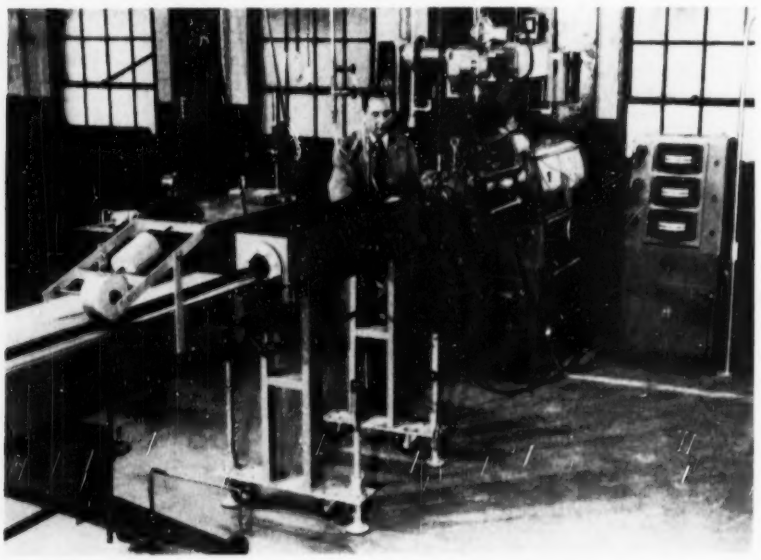


Peerless 10 x 10-Inch Saw Built With Heavier Frame

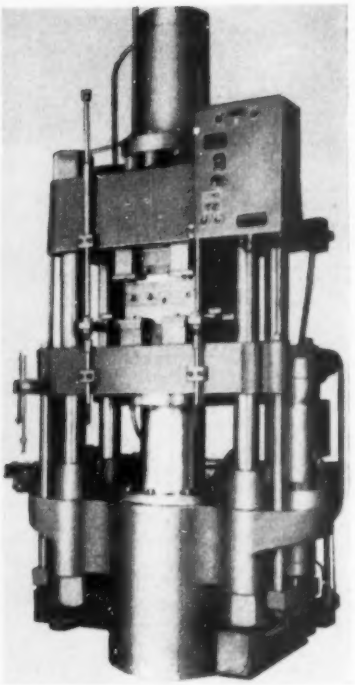
A standard Model 10x10-in. metal cutting saw is announced by Peerless Machine Co to replace their 9x9-in. standard model. The new model has a heavier overarm which carries and guides the saw frame. The saw frame has wider shoulders for more rigid control of the saw blade. Hardened and ground steel bearing shoes can be replaced by the user.

The work clamping vise is arranged to clamp work from 90 to 45 deg. A centrifugal force coolant pump provides proper coolant flow at all times.

Peerless Machine Co, 1600 Junction Ave, Racine, Wis



PACKAGE UNIT for extruding thermoplastic pipe materials includes extruder, dies, cooling unit, pulling mechanism, and either manual or automatic cut-off saw. Standard units extrude pipe up to 6-in. dia with wall thickness of 0.050 in. or less. Extruders, but not complete packages, are available for pipe to 21-in. dia. Package units are available with 65, 100, and 200 lb. per hour capacity —F J Stokes Machine Co, 5500 Tabor Road, Philadelphia 20, Pa

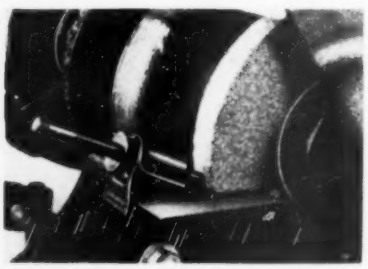


Logan Engineering to Build Hydraulic Molding Presses

Logan Engineering Co, which has previously built lathes, shapers, and safety mine equipment, has announced a line of hydraulic presses.

Pressure range is from 20 to 400 tons. The presses are designed primarily for plastic and rubber molding, but are said to be adapted to other industrial use. They will include self-contained fast traverse, governed pressures, up and down strokes, top or bottom transfer, and semi-automatic pressure controls. A line of standardized small presses will also be produced.

Logan Engineering Co, 4901 W Lawrence Ave, Chicago 30, Ill



Diamond Dresser

The Dymondcut dresser is designed for either angle or side dressing on pedestal, hand, carbide, surface, disk, and toolroom grinders. It is recommended for wheels up to 10-in. dia.

Hazerodt Associates, 416 Ford Bldg, Detroit 26, Mich

FYI

FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 BORING, DRILLING MACHINES — *Cincinnati Gilbert Machine Tool Co, Cincinnati 25, Ohio.* 8-page catalog No. 1152 covers radials, table and floor type boring mills and accessories. Describes features and includes specifications.

2 SURFACE FORM GRINDER—*Ex-Cell-O Corp, Detroit 32, Mich.* 4-page bulletin 50226 describes style 84 precision unit for grinding flat, grooved, or curved surfaces on roots of jet engine compressor blades and turbine buckets in automatic cycle.

3 CRANK PIN GRINDER—*Landis Tool Co, Waynesboro, Pa.* 24-page catalog N-52 illustrates type DH unit for precision grinding of crankshafts. Design details, applications and operating controls included.

4 LATHES — *Simmons Machine Tool Corp, Albany 1, N.Y.* 4-page bulletin No. 92952 covers heavy duty geared-head engine lathes for turning, facing, and threading to close tolerances. Specifications included.

5 DRILL PRESSES—*South Bend Lathe, South Bend 22, Ind.* 12-page catalog No. 5306 covers complete line, including precision, economy, and multi-spindle production models and attachments.

6 AUTOMATIC DIEING MACHINES—*Henry & Wright Mfg Co, Div, Emhart Mfg Co, Hartford, Conn.* 60-page brochure contains extensive data on line ranging from 25- t. 400-ton capacity. 25 typical parts illustrated in production from raw stock to finish. Accessory equipment described.

7 DOUBLE CRANK PRESS — *Niagara Machine & Tool Works, Buffalo 11, N.Y.* 28-page bulletin 56-B illustrates detailed information on gap frame units with air-actuated, electrically controlled sleeve clutch.

8 CONTOUR SHEAR—*Wales Strippit Corp, N Tonawanda, N.Y.* 4-page catalog TS provides illustrated information on unit for circle and shape cutting, beading, and forming. Accessories and specifications listed.

9 DRILL PRESS—*Kurt Orban Co, New York, N.Y.* 4-page illustrated booklet provides data on the Alfing model BK 25 heavy duty upright machine. Design features and specifications included.

TOOLS AND ACCESSORIES

10 CUTTING TOOLS — *Illinois Tool Works, Chicago 30, Ill.* 48-page illustrated catalog 101 contains complete price and dimensional information on all Illinite standard tools, including end mills, saws, milling cutters, tool bits, hobs, and shaper cutters.

11 THREADING TOOL—*Rivett Lathe & Grinder, Inc, Boston, Mass.* Illustrated bulletin 110D describes tool and indexing system which presents each of ten cutter teeth to the work to form the thread.

12 QUENCHING OIL FILTERS—*Industrial Filtration Co, Dept 00580, Lebanon, Ind.* 4-page bulletin on Delpark filters and applications discusses reasons for quenching oil failure and illustrates efficiency features of filters.

13 COLLETS—*Sutton Tool Co, Sturgis, Mich.* 28-page catalog No. 18 lists complete line, covering every size and type. Special tools such as adapters, bushings, mandrels, and boring bars, illustrated and described.

14 TAP MANUAL—*Threadwell Tap & Die Co, Greenfield, Mass.* 56 pages of information on problems, definitions of terminology, and formulas for various threads, as well as tables of specifications, speeds, etc.

15 GAGE BLOCKS—*Webber Gage Co, Cleveland 11, Ohio.* 32-page catalog provides information on physical characteristics, accessory use, care of blocks, how to measure angles, etc.

16 OPTICAL GAGING—*Eastman Kodak Co, Industrial Optical Div, Rochester 4, N.Y.* 12-page booklet gives specifications and features of Kodak contour projectors

Name .....
Title .....
Company .....
Co. Address .....
.....
AMERICAN MACHINIST, New York — Not good after May 2, 1953

FILL IN BELOW NUMBER OF ONE CATALOG WANTED

(Repeated six times)

FYI
FOR YOUR INFORMATION

Model 2A for precision micrometry and Model 3 for fast routine gaging. Uses of special fixtures and charts illustrated.

17 CUTTERS—*Ingersoll Milling Machine Co, Rockford, Ill.* 72-page catalog No. 60K provides illustrated data on inserted blade milling and boring cutters for all makes of equipment. Information on carbide milling of steel, cutting methods, selection of tools, etc.

18 TUNGSTEN CARBIDE TOOLS—*General Electric Co, Carboloy Dept, Detroit, Mich.* 26-page catalog and maintenance instruction manual tells when and how to sharpen, equipment required, and techniques to follow.

HEAT-TREATING AND WELDING

19 ROLLER HEARTH FURNACES — *Surface Combustion Corp, Toledo 1, Ohio.* 4-page bulletin SC-160 illustrates controlled atmosphere, direct-fired, and convection-heated units. Typical applications in ferrous and non-ferrous fields included.

20 CALROD HEATERS—*General Electric Co, Schenectady 5, NY.* 16-page bulletin GEA-5866 contains 14 case histories on applications of built-in electric heat. Covers heating surfaces, melting soft metals, radiant heat, heating liquids and process air.

21 WELDING ROD — *Wall-Colmonoy Corp, Detroit 8, Mich.* 4-page illustrated folder Form 103 describes properties, applications and typical uses of Colmonoy No. 1 hard facing welding rod. 48 typical processed parts are listed.

22 WELDING ACCESSORIES — *A O Smith Corp, Welding Div, Milwaukee, Wis.* 16-page catalog of complete line, available by package-buying method.

PLANT-SERVICE EQUIPMENT

23 STEEL SHELVING — *Precision Equipment Co, Chicago 41, Ill.* 31-page catalog illustrates and describes complete line of storage and maintenance equipment. Prices and specifications included.

24 ELEVATORS & CRANES—*Barrett-Cravens Co, Chicago 9, Ill.* 36-page illustrated bulletin 5211 describes complete line of portable units, hand and electrically operated.

25 INDUSTRIAL EQUIPMENT—*Worthington Corp, Harrison, NJ.* 20-page catalog WP-1099-B27M contains condensed information on sizes, dimensions, capacities, ratings, and features of air conditioning and refrigeration units, engines, pumps, etc.

26 CONVEYOR BELTS — *Cambridge Wire Cloth Co, Cambridge, Md.* 140-page catalog provides data on uses for wire mesh belts, including photos and flow sheets, drive mechanisms, and metallurgical tabular information.

27 WORK GLOVES—*C Walker Jones Co, Philadelphia 35, Pa.* 12-page catalog illustrates Jomac line, including heat- and flame-resistant models, Glov-Safers, and special hand pads and sleeves.

28 RAM & FORK TRUCKS—*The Elwell-Parker Electric Co, Cleveland 3, Ohio.* Brochure illustrates units with 12,000- to 60,000-lb capacities. Detailed descriptions of 11 models and application data included.

29 CENTRAL VACUUM CLEANING SYSTEM — *Lamson Corp, Syracuse, NY.* 20-page booklet contains extensive information on Exidust unit. Design features and engineering data included.

30 ELECTRIC POWER DISTRIBUTION —*General Electric Co, Schenectady 5, NY.* 28-page illustrated bulletin GEA-4000 is an idea book on practices for large and small plants. Discusses wide range of problems and applications.

31 CONTROL CENTERS—*Westinghouse Electric Corp, Pittsburgh, 30, Pa.* 31-page booklet B-5421 covers three types of centers; various components that make up typical units are illustrated and defined. Reference tables provided.

PARTS AND MATERIALS

32 CAST STEEL VALVES — *Edward Valves, Inc, East Chicago, Ind.* 56-page catalog covers globe, angle, and check units, plus disk valves for hand or motor control of volume. Dimensions, construction features, and technical data included.

33 MEEHANITE METAL FOR DIES—*Meehanite Metal Corp, New Rochelle, NY.* 46-page bulletin No. 41 describes and illustrates wide variety of die applications. 8-und slide film available.

34 FASTENERS — *Simmons Fastener Corp, Albany, NY.* 96-page illustrated catalog No. 1252 covers complete line for wide-range applications. Dimensional drawings, installation details, engineering data included.

35 ALUMINUM EXTRUSIONS — *Precision Extrusions, Benzonville, Ill.* 98-page book covers 4000 standard shapes and sizes. Physical properties and applications in chart form for 14 most generally used alloys included, as well as indexes and isometric drawings.

36 OVERLOAD RELEASE CLUTCHES —*Overload Release Clutch Co, Inc, Newark 8, NJ.* 12-page booklet illustrates protective device against overloads and jams. Available in all sizes and types for any kind of machinery and drives.

37 COUPLING OR CONVERTER? — *Twin Disc Clutch Co, Racine, Wis.* 32-page illustrated booklet covers specific uses for each; explanations of hydraulic couplings and torque converters with special advantages of each type drive.

38 WIRE THREAD INSERTS—*Heli-Coil Corp, Danbury, Conn.* 8-page bulletin 660 discusses design, production, marketing, and maintenance advantages gained by this method of thread protection.

39 PUMPS — *Allis-Chalmers Mfg Co, Milwaukee, Wis.* Illustrated bulletin 52B6083A covers construction features of supporting-adapter type, close-coupled general purpose unit in capacities to 2500 gpm at heads to 550 ft.

40 BUSHINGS—*American Drill Bushing Co, Los Angeles, Calif.* Catalog covers line of drill jig bushings. All lengths available as standard. Technical reference charts and data included.

41 HYDRA SPRINGS — *Wales-Strippit Corp, N Tonawanda, NY.* 4-page folder provides illustrated data on Series 500 with force up to 3500 lb.

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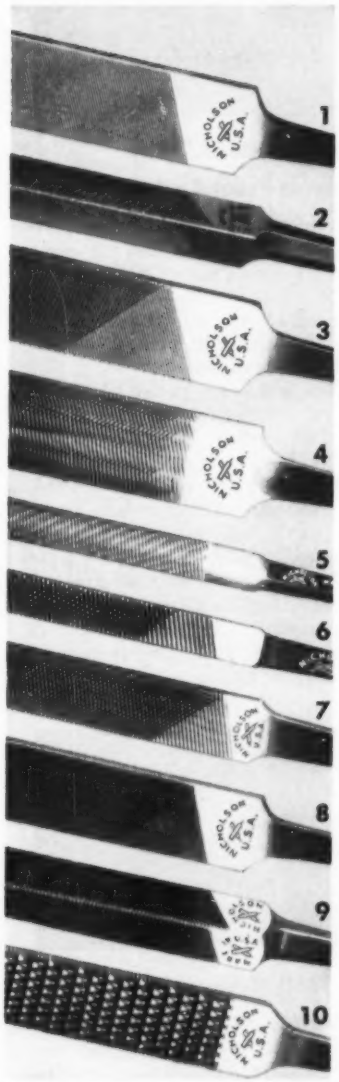
The right file for the job and ***Twelve perfect files in every dozen.*** . . . Through four generations of Nicholsons these two keynotes have been interwoven with the aims and policies of America's foremost file manufacturer. Here they have inspired every development in file engineering; guided every stage of file manufacture; spearheaded every phase of service to the industrial user. They definitely lead to better work, higher production, lower filing costs. Thousands of kinds, cuts and sizes. Examples:



REGULAR PURPOSE FILES

(1) **MILL**—for smoothing, edge sharpening, large-tooth saw filing.

(2) **TAPER**—Regular, Slim, Extra Slim, Double Extra Slim types—for sharpening hand saws.

(3) **FLAT.** (4) **HALF ROUND.** (5) **ROUND.** (6) **SQUARE.** (7) **PILLAR.** (8) **KNIFE.** (9) **THREE SQUARE.** Mostly double cut—for fast stock removal.

(10) **WOOD RASP**—Flat and Half Round types.

SPECIAL PURPOSE FILES

(11) **G. P. MACHINIST'S**—a special file combining the "General Purpose" principles of both regular Mill and Flat files to give metal-removing speed with smooth finish.

(12) **SUPER-SHEAR**—a patented curved-tooth file with teeth in off-center arcs, for roughing and smoothing in one operation. Serrations break up filings.

(13) **CURVED TOOTH**—rigid tanged type for filing flat surfaces. Flexible type (with holder, not shown) for concave and convex surfaces as well as for larger flat areas.

(14) **LEAD FLOAT**—has coarse, short-angle "blade"-like teeth which shear or "float" away metal. For lead, copper and other soft materials.

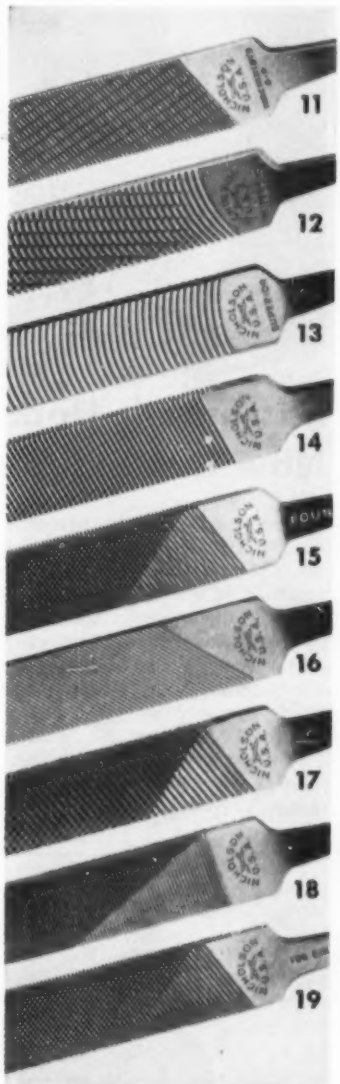
(15) **FOUNDRY**—has extra-rugged teeth to resist breaking out. For fast metal removal on castings.

(16) **LONG ANGLE LATHE**—teeth cut for chip clearing and clean shearing—for fast, smooth finishing.

(17) **ALUMINUM TYPE "A"**—special serrated-tooth and "open-throat" cut, to prevent clogging. For aluminum and other ductile metals.

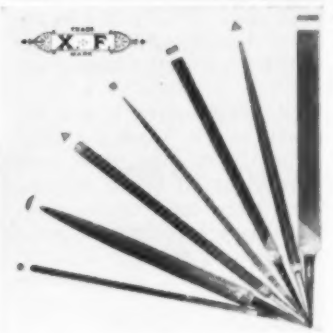
(18) **BRASS**—short-angle "upcut" teeth prevent file running off work and help keep gullets clear of chips. Long-angle "overcut" breaks up filings.

(19) **STAINLESS STEEL**—special-shape teeth to withstand high abrasive action of stainless steel's tough chromium carbides and nickel alloy.



X. F.* SWISS PATTERN FILES

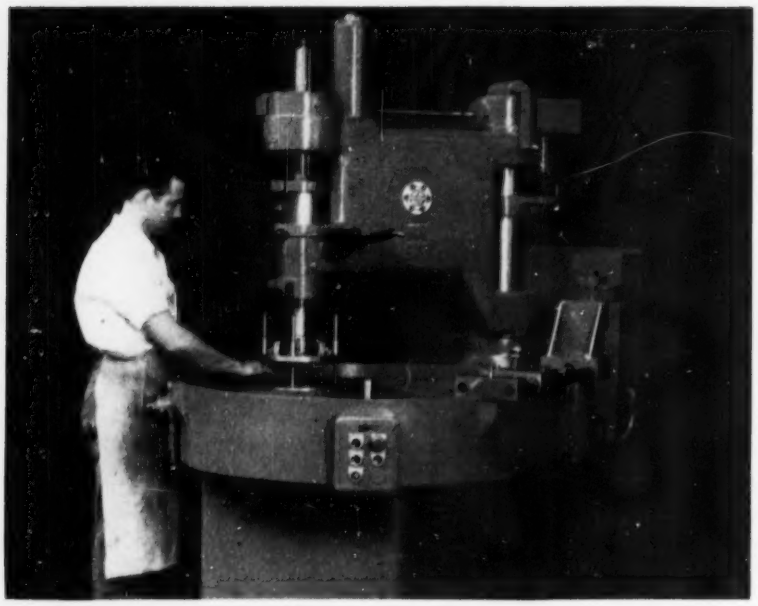
Hundreds of shapes, cuts and sizes for hand and machine filing of precision tools, dies, fine instruments—all sorts of delicate and intricate pieces. Made to more exacting measurements than American Pattern files—with smaller points, longer tapers, finer cuts. **X.F. means Extra Fine.*



ROTARY FILES

All popular shapes and head sizes in (1) *Hand-Cut Hi-Speed Steel*, (2) *Ground Burs Hi-Speed Steel*, and (3) *Ground Burs Carbide;* in both ¼" and ⅛" shanks. Accurate cuts and peripheries, true-centered shanks—Nicholson superior quality throughout.

NICHOLSON FILE COMPANY
29 Acorn St., Providence 1, R. I.
(In Canada, Port Hope, Ont.)



Micromatic Hone Model 844 Now Has Independent Spindle Speeds

Several improvements are announced in the Model 844 Microflat Microhoning machine for precision finishing of optically flat surfaces up to 20-in. dia. Spindle speed may be changed, independent of wheel speed, by inserting in the head one of four worm gears, ranging from single to quadruple thread.

Direction of spindle rotation is controlled by a clutch with forward, neutral, and reverse positions. One control proportionately changes spindle wheel speeds at the same time.

The head may be moved without disturbing its previously set oscillating stroke to permit swinging the permanently mounted motorized dresser to swing to dressing position.

An air cylinder provides easy lift of spindle and attached fixture. An adjustable stop on the quill housing permits repetition of height setting and adjustment for wheel wear.

Micromatic Hone Corp, Detroit 4, Mich

P&W Air Cartridge Unit Applied Like Dial Indicator

Air Cartridge Units, developed by Pratt & Whitney for use with Air-O-Limit gages, are applied in single or multiple station fixture gages much the same as dial indicators.

The unit consists of a plunger with a contact point on one end and a stainless steel ball on the other end operating with axial movement in the cartridge body. Air flow through the cartridge unit is restricted by the ball on the plunger operating in a tapered hole in the body, setting up the back pressure required to operate the air gage.

Units are 1¾ in. long and ⅜ in. dia. Primarily for coarse tolerance work, they are available in three magnification ranges operating on total scales of 0.010, 0.015, and 0.020 in. They can be furnished with total scales ranging from 0.0006 up to 0.003 in.

Pratt & Whitney, Div Niles-Bement-Pond Co, West Hartford 1, Conn

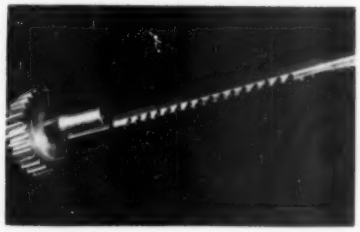
Lightweight Hand Truck Has Single-Pedal Control

Lighweight Xpediter material handling truck can be used on elevators and floors where heavy units cannot operate. Six models of the 12-in. load center unit are available, hydraulic and manual lifts, to handle materials up to 800 lb.

Driver rides on pedal platform; forward, reverse, and speed are controlled by pressure of the operator's foot on a single pedal. Maximum speed is 9 miles per hr forward, 7 reverse; unit will operate in 56-in. aisles, turns in 68-in. radius.

Accessories include a 32-in. wide utility plate which can be attached to barrel-handling front, and a trailer hitch adding 5¼ in. to length of trucks, ranging from 68¾ to 81¼ in.

Kalamazoo Manufacturing Co, Kalamazoo, Mich

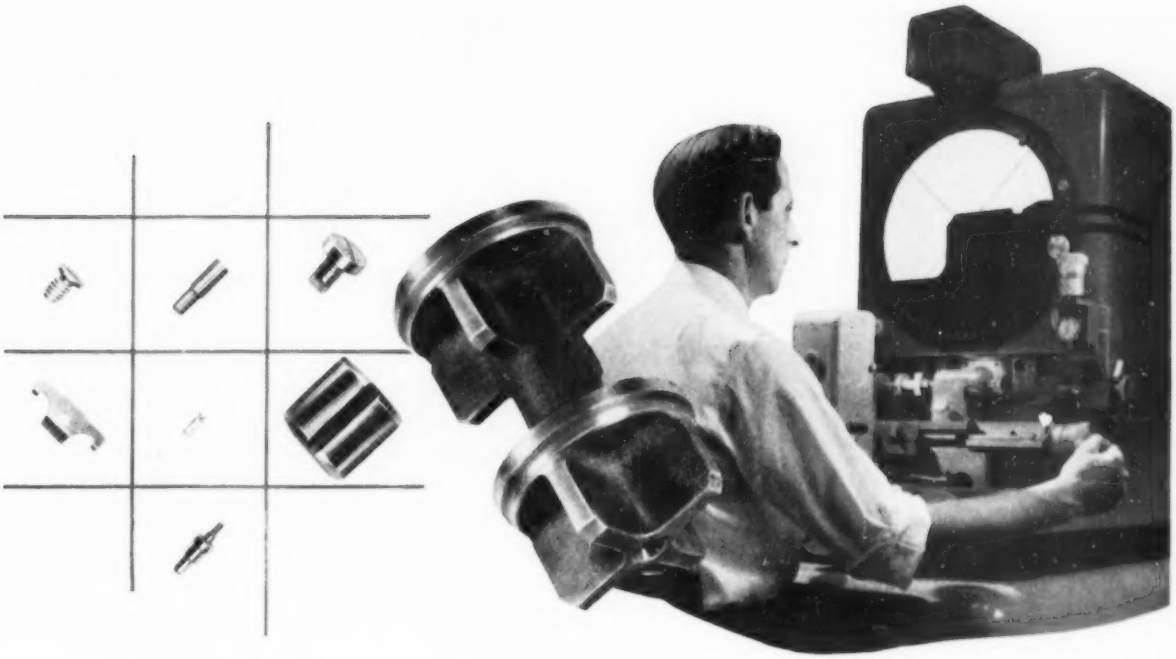


New Tooth Form for Keyway Broach

Minute Man keyway broaches are being manufactured with a new tooth form designed to give greater chip room, better curling of the chips, and to prevent clogging or wadding.

The new development is said to be superior to the common tooth form with its straight flank and small radius which tends to corrugate the chip, resulting in poor finish. Less force is required to push the tooth form broach through the workpiece. Available in all sizes from 1/16 to 1 in.

The du Mont Corp, Greenfield, Mass



These parts help give Weston instruments their accuracy... they're checked on Kodak Contour Projectors

There is such a great variety of Weston instruments to measure all sorts of variables in all sorts of ranges that production on most individual items is small.

This creates a parts inspection problem. Precision requirements in many cases are so stringent that any measurable deviation from specifications is too big. Setting up toolroom instruments takes too long for the small volume of work being checked at any one time. Mechanical gages are even less economical at the low volume levels, and they just did not give the required accuracy on such jobs as checking the shoulder angles, concentricities, and specifications of the double-acting valve body shown above. (It goes in a recording thermometer and Weston makes it in many different sizes.)

Now Weston has converted to Kodak Contour Projectors. An inspector merely picks up the specification sheet covering a given part, gets the chart gage indicated there, puts it on the screen of the projector, and proceeds to sample according to specifications. Often, as with the valve body, gage blocks are used to step off the traverse of the projector work table. The inspector notes whether a shadow image coincides with a chart line after the table has carried it by the specified distance.

Possibly your inspection problems are volume and speed rather than the flexibility that Weston wants. In that case you will want to know about the Kodak Contour Projector, Model 3, which is designed for use with special staging fixtures instead of a moving work table. There is a field engineer in your area who can show you which model best fits your problem. To get in touch with him, just drop a note to *Eastman Kodak Company,* Industrial Optical Sales Division, Rochester 4, N. Y.

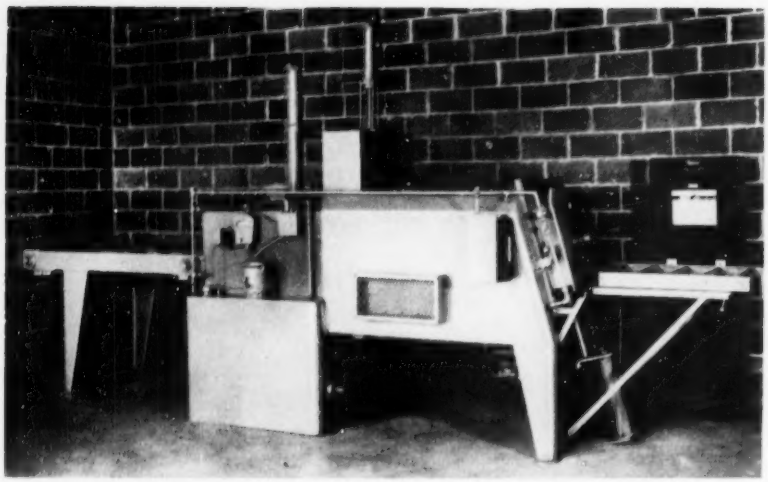
the KODAK CONTOUR PROJECTOR

Optical Gaging

A new sound movie shows how to simplify complex inspection problems. We'll tell you how to get it for a showing.

Kodak

TRADE-MARK



Ipsen Draw-Quench Furnace Is Automatic, Sealed Unit

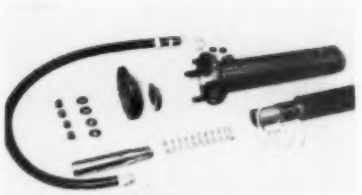
D-Q 300 furnace is a combination draw-quench metal-treating unit designed for both bright, scale-free tempering and controlled oxidation tempering from 400 to 1400 F.

Controlled endothermic atmosphere is provided in both heating and cooling chambers. Parts being treated do not contact air at any time. After completion of the heating cycle, the intermediate door opens and chain-driven rods move into the heat zone, contact the load with cam-actuated arms and transfer the trays to the quench rack. The intermediate door reseals automatically, allowing another work tray to be loaded into the heat zone.

For controlled oxidation or blueing, a predetermined quantity of water is admitted automatically into the furnace during part of the heating cycle. This water vaporizes, forming the oxidizing atmosphere.

Temperature of the sealed quench and cooling zone are controlled by immersing heating elements and water jackets around the cooling chamber. The hearth of the electric furnace is 24x36x12 in. high.

Ipsen Industries, Inc, 715 S Main St, Rockford, Ill



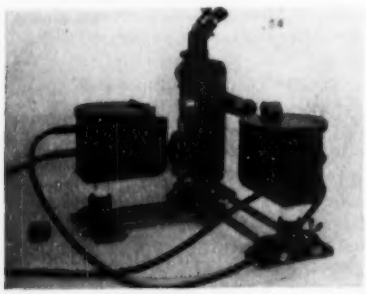
Automatic, Continuous Rappers For Precipitator Maintenance

A magnetic-impulse rapping system, which delivers continuous rapping impacts of light and easily controlled intensities, has been developed for electrostatic precipitators.

Method uses a solenoid-actuated rapper energized by a pulse generator, instead of a mechanical or pneumatic device. Unit can be easily installed on any standard precipitator.

Central pulse generator delivers tripping impulses to each of the units, up to 24 per precipitator, at intervals of 2½ seconds, to rap entirely in one minute or less. Power consumption is low and noise is completely eliminated. Separate remote control unit permits monitoring from any location.

Research Corp, Bound Brook, NJ



Portable Spectroscope

The Steeloscope is an instrument that can be portable for spectrographic analysis within the range of the visible wave lengths. The spectrum is generated by an electric arc. Minute quantities of the specimen are volatilized at a temperature of about 4000 C, with the specimen serving as one of the electrodes, while a revolving disk of copper serves as the counter electrode.

By rotating the measuring drum, the prism system can be swung, causing the spectrum of the wave length range violet through red to pass before the eye of the viewer. An eyepiece mark permits correct fixing of each spectral line, while the measuring drum with vernier reading provides numerical evaluation.

The instrument is available with one specimen table, with two specimen tables (one for a standard sample for comparison), and an attachment which makes the instrument completely portable. The Steeloscope is hung by a leather strap around the operator's neck. A fork is brought into contact with the specimen which assures that the arc at all times coincides with the optical axis. In this way tests of large fixed objects can be made.

William J Hacker & Co, Inc, 82 Beaver St, New York 5, NY

Stepless Current Selection

General Electric has redesigned its 300-amp ac welding transformer to provide stepless current selection from 40 to 375 amp. It will accommodate electrodes from 3/32- to ¼-in. diameter.

Arc-stabilized capacitors in the redesigned welder are said to enable the operator to strike and maintain an arc without popouts. Silicone insulation protects against high-temperature coil failure.

General Electric Co, Schenectady 5, NY

here's how

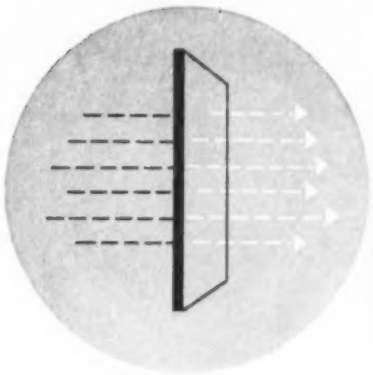
you can

CUT COSTS

INCREASE PRODUCTION

in all types of

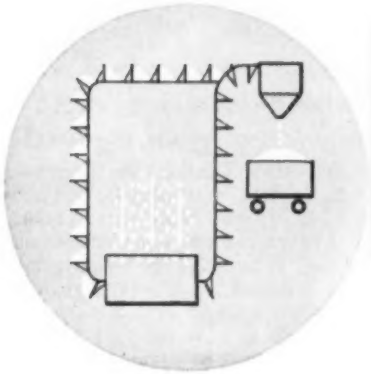
METAL WORKING OPERATIONS



1 **HOUDAILLE AUTOMATIC FILTERS** ...to keep oils and coolants clean

magnetic? web? clarifier?

for individual machine tools or central systems



2 **HOUDAILLE AUTOMATIC CONVEYORS** ...for automatic, low-cost removal of chips, scale, sludge, etc.

1+2 =

- **Fewer Rejects—Increased Production**
- **Longer Tool and Wheel Life**
- ***Much* Lower Maintenance Costs**
- **Reduced Oil and Coolant Costs**

WORLD'S LEADING OIL FILTER MANUFACTURER

ALL HONAN CRANE EQUIPMENT IS SOLD ON A PERFORMANCE GUARANTEED BASIS

Fill in coupon below for complete details on Houdaille automatic filtration and handling equipment.

Honan-Crane Corp. 205 Wabash Avenue, Lebanon, Ind.
a subsidiary of **Houdaille-Hershey Corp.**

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☐ **Houdaille Oil and Coolant Filters**

☐ **Houdaille Automatic Conveyors**

NAME ..... TITLE .....

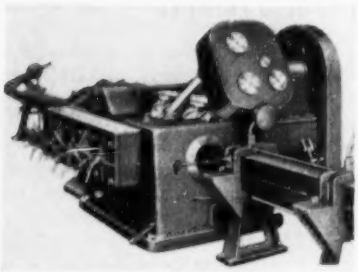
COMPANY ..... ADDRESS .....

In Canada:
E. W. Playford, Ltd., Montreal 28 • W. E. Micklethwaite, Toronto 18 • Cummings Galbraith, Ltd., Edmonton, Alta.

Wire Holder for Thread Measurement

A thread wire holder is said to simplify the three-wire method of measuring pitch diameter. It has a stem which holds the double wires and thimble supporting the single wire. Each stem is calibrated for one American Standard pitch and has accurately milled slots to insure parallelism between the double thread wires. The single thread wire is supported by a wire chuck which permits the wire to assume the helix angle of the thread being measured. Measuring pressure of micrometer will expand the spring of the wire chuck to permit the single wire to take a position parallel with the double wires.

Scully Machine Co, 62 Walter St, Bridgeport, Conn



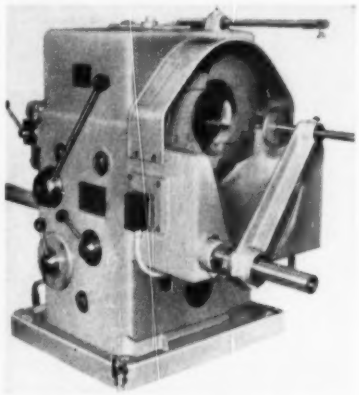
Tube Straightener for Steel, Brass, and Aluminum Pieces

Heavy-duty tube or bar straightening machines, made by Kieserling & Albrecht, Germany, are available in this country.

Unit straightens entire tube lengths in one pass at a rate of 165 ft per minute without damage, deformation or spiral marking impressions. Heavy-gage tubes, as well as thin-walled pieces, can be processed. Roll adjustment permits handling tubes of ⅛- to 9⅞-in. dias.

Power drive is through V-belts and enclosed gearbox. Guide channels for intake and exit of tubes are designed to prevent piece from whipping during operation; straightened tube falls into a cradle after passing through the machine.

Henry A Spittler, 50 Church St, New York 7, NY



Precision Tube Cut-Off Machine

These machines with stationary tube, rotating cutters, and hydraulic chucking, are made by Kieserling & Albrecht, Germany, and are now being distributed here.

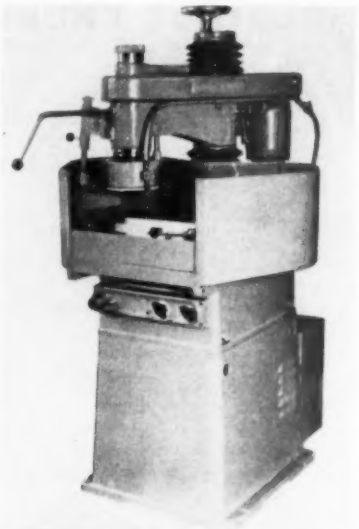
Units cut steel, stainless, brass, and aluminum tubes in clean, square cuts with a minimum of burrs. Both pipe and tubing in heavy wall thicknesses can be processed.

Flexible collet chuck can grip tubes with large tolerances; tubes are concentrically seized in front of cutters to eliminate any vibration. Stop gage action effects unhindered cut-off drop at the start of cutting.

Machine is driven by a normal foot or flange motor over a multiple-speed change gear to the working shaft; speed change is controlled by a hand lever.

Five models handle varied diameter tubes ranging from ⅜ to 7⅛ in. Normal cutting speed is from 90 and up ft per minute.

Henry A Spittler, 50 Church St, New York 7, NY



Surface Grinder Speeds Output With Vertical Spindle, Cup Wheel

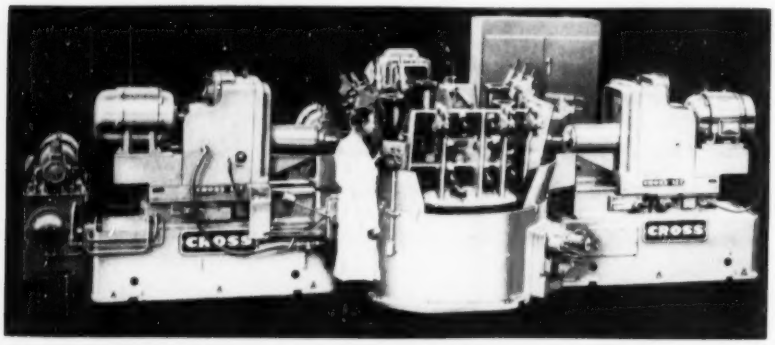
This surface grinder uses a vertical spindle and cup wheel. Work is placed on the table or magnetic chuck, and cup wheel is passed rapidly over it by hand for rough grinding; hydraulic feed is then engaged for finish work.

Spindle is adjusted vertically by means of a large handwheel; fine adjustment is attained by a large-diameter graduated drum reading in 0.0004 in. Machine uses 7½-in. dia standard Norton cup wheels. A diamond dresser is attached directly to the wheel housing so that it is instantly available for dressing. Unit is equipped with pump and piping for wet grinding.

George Scherr Co, Inc, 200 Lafayette St, New York 12, NY

Rust-Sol No. 123, a phosphoric acid cleaner in concentrate form, can be applied to ferrous metals by brush-on or immersion, and rinsed off with clear water. Dissolves all surface salts, rust, scale; neutralizes and activates surface with a slight etch and iron phosphate coating for a painting base. Can be used following alkali stripping or cleaning.

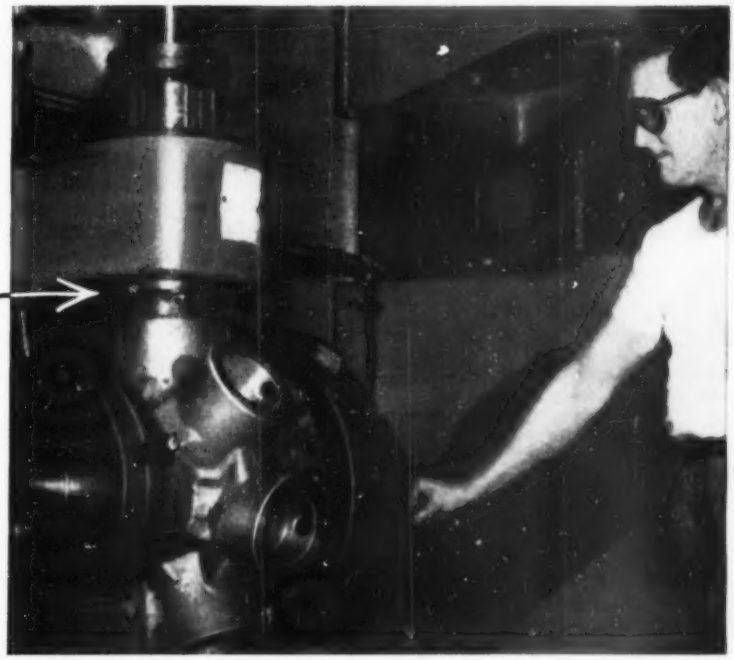
Klem Chemicals, Inc, 14501 Lanson, Dearborn, Mich



TANK SUSPENSION support housings are drilled and reamed in this special machine. Housings are cast armor with hardness of 42 Rc. Parts are held on a fluid, motor-driven index table with four stations, drilled and reamed with 4-in. dia holes at the rate of 11 pieces per hour. Pre-set tools reduce downtime — *The Cross Co, Detroit 7, Mich*

2000 Cylinder Ports per Grind

because HAYNES STELLITE *tools resist* CHIPPING and SPALLING



This boring head, containing 20 HAYNES STELLITE inserted blades, operates for 4 to 6 weeks without grinding.

Here is how the HAYNES STELLITE blades are positioned in the boring head.

A multiple blade boring head containing 20 HAYNES STELLITE alloy inserted blades operates from 4 to 6 weeks without regrinding at a plant making refrigeration and air-conditioning equipment. The tools bore, chamfer, counterbore, drill, and face the cylinder ports in cast iron compressor heads. This is all done in one operation.

HAYNES STELLITE blades average over 2000 cylinders per grind even though machining is complicated by an intermittent cut at a gas outlet port in the cylinder wall. The tools are good for 25 regrinds—an average of 50,000 cylinders per cutter.

Tools made of HAYNES STELLITE alloy resist chipping and spalling—even on tough jobs like this one. This is one reason why the tools are easy to grind and can be reground so many times.

For information on how to use HAYNES STELLITE tools on your machining jobs, write for the booklet "HAYNES STELLITE Metal-Cutting Tools." It gives helpful information on chip formation, tool design and the machinability of metals.

HAYNES TRADE-MARK *alloys*

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

"Haynes" and "Haynes Stellite" are trade-marks of Union Carbide and Carbon Corporation.

Fractional-Size Tube Fittings

Standard Swagelok tube fittings are now available in fractional sizes for holding thermocouples. Connectors are bored completely through at one diameter; in an emergency, they can be bored through to the required diameter in the shop to accommodate a thermocouple.

Available in a wide variety of sizes from ⅛ in. up, in brass, aluminum, steel, stainless, and Monel.

Crawford Fitting Co, 884 E 140th St, Cleveland 10, Ohio

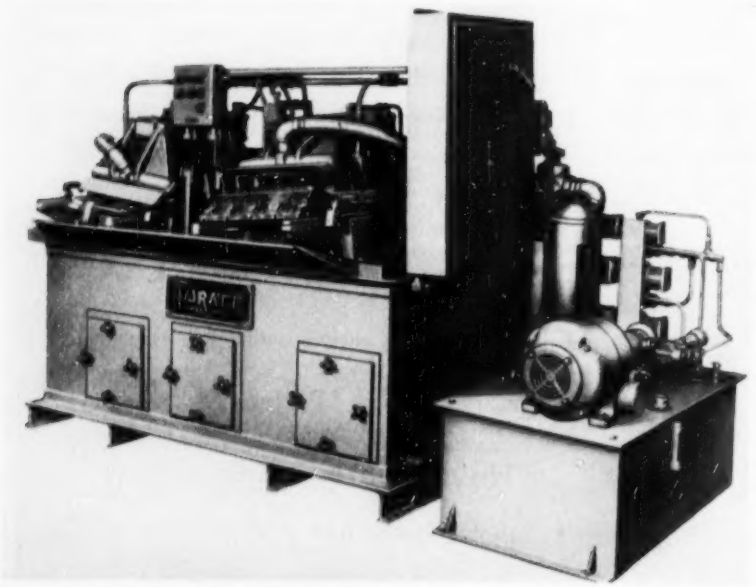
Warren Spintesting Equipment

Test equipment for high-speed rotation of fan impellers, turbine rotors, and other parts at abnormal centrifugal forces is available in three sizes. Model VHS-1 tests parts to 2500 lb, 55-in. dia, at 25,000 rpm; Model VHS-2 tests parts to 200 lb, 20-in. dia, at 60,000 rpm; and VHS-3 tests parts to 15 lb, 15-in. dia, at 100,000 rpm.

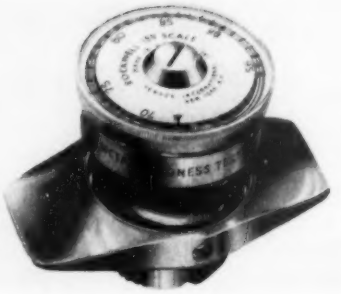
To reduce the temperature rise from air friction, pressure in the spin pit is evacuated down to about 200 microns of mercury absolute. The spin pit is a cylindrical steel tank with a cover plate to which is attached the mounts of a drive turbine. The drive turbine may be either steam or air operated.

Warren Brothers Manufacturing Div, Warren Brothers Roads Co, Cambridge, Mass

FURNACE BRICK—Alfrax BI "bubble-brick" is incandescent at one end (over 2000 F) but can be held at the other end in the operator's bare hand. Brick is made of hollow spheres of aluminum oxide, said to be one of the most heat resistant refractories available—*The Carborundum Co, Niagara Falls, NY*



CYLINDER HEAD FLUSH-OUT MACHINE tests and washes sand and chips from engine cylinder heads. Water pressure is automatically applied to the fixture and forced into all unsealed openings in the cylinder head—*Turner Bros, Inc, 2625 Hilton Road, Ferndale, Mich*

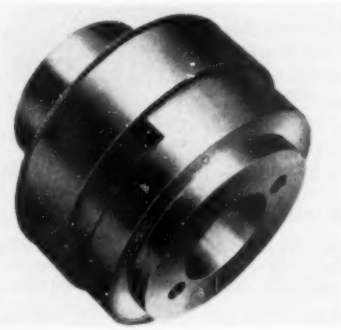


Superficial Hardness Tester Is Portable, Direct Reading

Ernst portable superficial metal hardness tester gives direct dial reading on the Rockwell 15N Scale from 70 to 95. The tester is placed on the surface to be inspected and pressed down. A direct reading is obtained.

Pressing down on the hand grip lowers the indentor housing against the surface and allows the diamond indentor to penetrate the surface under the action of a calibrated helical spring. Movement of the indentor compresses the diaphragm of a fluid-filled chamber. Fluid is forced into the capillary tube which encircles the dial, giving the reading.

Newage International, Inc, 235 E 42nd St, New York 17, NY



Space Saving Coupling

Modified Lovejoy type C coupling, with one hub cut off, has three or more holes tapped in the remaining flange, by which the coupling is fastened to the center of the flywheel.

By crawling into the flywheel itself, the device not only saves space normally taken up by conventional hub length, but affords a cost saving over standard couplings in elimination of the flange.

In all other respects, including collar, load cushions, and inside sleeve, it is identical with the regular type C unit.

Lovejoy Flexible Coupling Co, 5039 W Lake St, Chicago 44, Ill

COMPARE

1. Features
2. Workmanship
3. Accuracy
4. Price

G.DUFOUR
MILLING MACHINE

with UNIVERSAL VERTICAL HEAD as Standard Equipment

The outstanding design, workmanship, high accuracy, and ease of operation, coupled with a very wide range of speeds and feeds, are reasons why this machine is sure to answer your highest production requirements, and give you years of trouble-free service. It is indeed outstanding in its simplicity of operation and control, the Universal Vertical Head making possible the most rapid and varied changes of tools and speeds without loss of valuable production time.

For Further Information and Name of Nearest Distributor Contact

Permasco

DIVISION OF PERRISH STEEL PRODUCTS, INC.
76 BEAVER STREET, NEW YORK 5, N. Y.
WHitehall 3-1460

1206 MAPLE AVENUE, LOS ANGELES 15, CAL.
PRospect 3197

Model 51

G. DUFOUR FEATURES

- Table 43 x 9¾"
- 16 Spindle Speeds 21—1600 RPM
- Spindle Taper #40
- 8 Feeds ⅜ to 14¾ in/min
- Dial Speeds
- Dial Feeds
- Rapid Traverse all Directions.
- Swivels Right or Left 30°
- Tripled Gibbed knee and column
- Double knee and table locks
- Safety handles
- Brake on spindle
- Independent Operation of Rapid Traverses
- 3 HP Spindle Motor
- 1¼ HP Traverse Motor
- All feed movements controlled by overload and safety devices. Weight 3100 lbs.

STANDARD EQUIPMENT

- UNIVERSAL VERTICAL HEAD
- ARBOR & OVERARM SUPPORT
- MOTOR DRIVEN COOLANT SYSTEM
- MOTORS & ALL ELECTRICAL EQUIPMENT

Remote Control Turntable

This turntable, controllable from a remote point, is instantly reversible and completely variable in speed from 0 to 20 rpm. Its varied uses include: testing, gaging, and inspecting; packing and collating; soldering, bronzing, and welding; assembly. Both reversing and speed switches can be modified for foot control.

The Flexi-Turn is equipped with a 1/15-hp motor drive operating through a heavy-duty speed reducer. The 18-in.-dia disk is mounted on an 11-in.-dia casting which handles any load up to 200 lb.

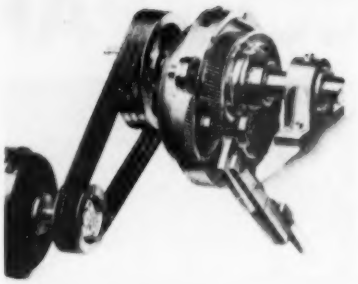
Remote control elements include an on-off switch, a light which indicates when turntable is running, single dial to set speed and control acceleration and deceleration, a forward-reverse switch, and a switch to double or halve the speed instantly.

Gale Dorothea Mechanisms, Elmhurst, LI, NY

Mercury Hand Truck-Trailer

Model A-310-326M is an all-steel, caster-steer trailer equipped with a simple brake mechanism designed for manual control of a hand truck and load on grades. With 4000-lb capacity, the truck is designed to handle pallet loads. Spring loaded brakes are applied by depressing a lever on the caster-end pipe rack. Self couplers at each end equip it for trailer duty.

Mercury Mfg Co, Chicago, Ill

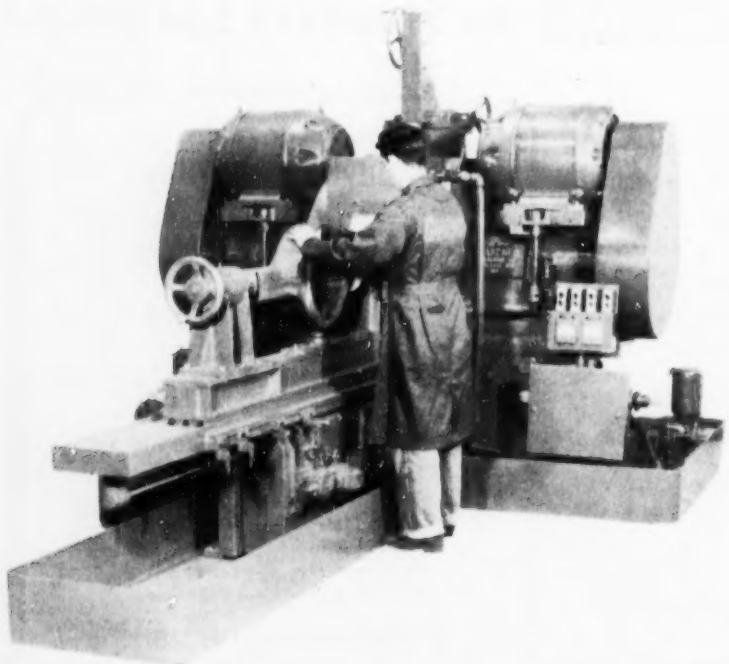


Shaft-Mounted Speed Reducers

Series of 20:1 ratio speed-reduction units, "Shaft-King," have two trains of single-helical gears. Gears are precision cut from alloy steel forgings and are flame hardened.

Both ball bearings and tapered-roller bearings are used. Splash lubrication is provided by the high-speed gear and countershaft pinion which run in a large oil reservoir in the lower third of the housing. Both input and output shafts are placed above the oil level by concentric shaft design so that bearing seals do not operate against a head of oil. The reducers can be mounted directly on the shaft of driven machine with twice the shaft diameter, plus clearance required for mounting.

The American Pulley Co, 4200 Wissahickon Ave, Philadelphia, 29, Pa



DOUBLE SPINDLE GRINDER for parallel faces of rear axle housing has two opposed grinding heads that operate hydraulically on slides with ball bearing ways. Hydraulic worktable carries fixture that locates work from a plug registering from the inside surface of each end. Production averages 30 per hour, removing 0.020 in. maximum stock per surface, and maintaining a tolerance of 0.015 in. for flatness — *Gardner Machine Co, Beloit, Wis*

Coolant and Diamond Salvage Provided by Grinding Attachment

Vap-Air Exhaust supplies an accurately controlled flow of coolant to the center of diamond grinding wheel. Excess coolant is sucked into a hood from which sludge is collected for salvage of the diamond dust. An auxiliary spray built into the hood keeps exhaust hose and fan flushed clean. The machine is said to make possible 60 to 75% saving in diamond grinding cost.

Shelboerg Mfg Co, 29 Ridgeview Drive, Indianapolis, Ind

Various Sizes and Graduations
Shockproof
Dial Indicators
Converts AGD Adjustable Limit Snap Gages to Dial Type Instruments
Patented
Dializers
Adjustable Limit Snap Gages
Dial Bore Gages
8 Sizes
Cover Range
¼"-12⅛"
Just a few of many
STANDARD Gages
In so many ways they help you do the job better . . . easier!
Dial Comparators
Dial Snap Gages
DuBo Plug Gages
Patented
Light in Weight
Sensitive, Definite
Check
Master Setting Gages
Write for the New Catalog C
STANDARD Gages
STANDARD GAGE COMPANY, INC.
STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

Tilting Fork Stacker

The telescopic tilting fork stacker has been added to the Powrworker line of Clark industrial trucks. Lightweight units are available in four base capacities of 1500, 2000, 2500, and 3000 lb, all rated at 24-in. center line of load.

Two standard models in each capacity incorporate the Hi-Lo stack principle; one has an 83-in. overall height with 64 in. of free lift and 130 in. max lift, the other has a 68-in. overall height with 49 in. free lift and 100 in. max lift.

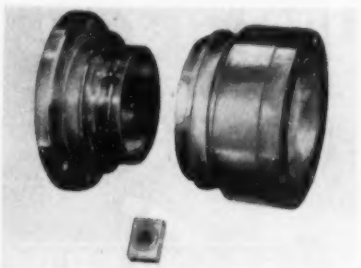
Clark Equipment Co, Buchanan, Mich

Closed Flame Gas-Oil Burner

Sealed, blast burner may be used with any gas or oil fuel for firing industrial furnaces, ovens, and process equipment in the operating range between 200 and 2400 F. Secondary air meets the gas or oil mixture in both a converging and rotating pattern, said to promote atomizing efficiency at the nozzle exit.

A rotating main combustion air casting permits adjustments for any desired alignment of piping. The burner has a high discharge capacity and low turndown range. Blocks are interchangeable with those of conventional burners. Sizes now available are 3 and 10.5 gph.

Eclipse Fuel Engineering Co, Rockford, Ill



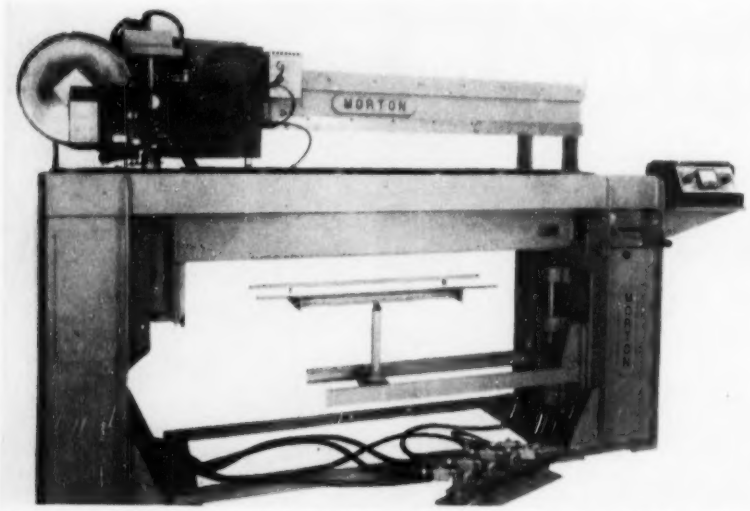
SNAP-TITE COUPLERS — Coupler for 8-in. pipeline has standard flanged connections. Can be supplied with a valve that shuts off the liquid flow when uncoupled. Connection is made or broken by sliding a sleeve on the coupler. Made in sizes from ¼ to 8 in.—*Snap-Tite, Inc, Union City, Pa.*

Compressed Air Condenser Filter

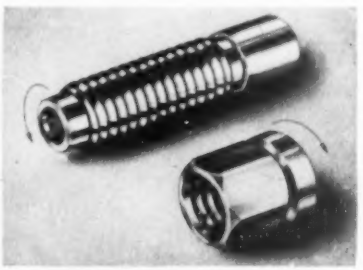
Model B-30-D condensifilter is said to provide compressed air of "instrument quality" by dehydrating and filtering ordinary plant air.

The filtering unit is made of wire mesh to which flannel is securely attached. The radial fin design provides 540 sq in. of filtering area. The condensing unit lowers the dew point to within 2 or 3 deg of the cooling water temperature.

Hankison Corp, 117 Biltmore Bldg, 951 Banksville Road, Pittsburgh 16, Pa



STAKE WELDING MACHINE, Model A, provides flat clamping which is said to have no tendency toward seam separation under load. The stake, mounted on an air-actuated vertical slide, is supported and aligned at the outer end by a manually-operated shot pin. Interlocking air valves protect the machine from improper operating sequence — *Morton Manufacturing Co, Muskegon Heights, Mich*



Swivel Shoe Holding Set

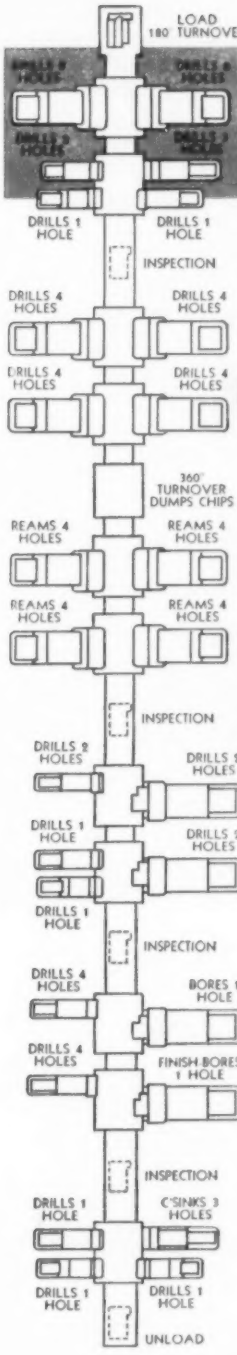
Swivel shoe sets for holding tools and parts are said to be adaptable to any type of tool, jig, or fixture. They provide positive holding without marring, scratching, or burring the part.

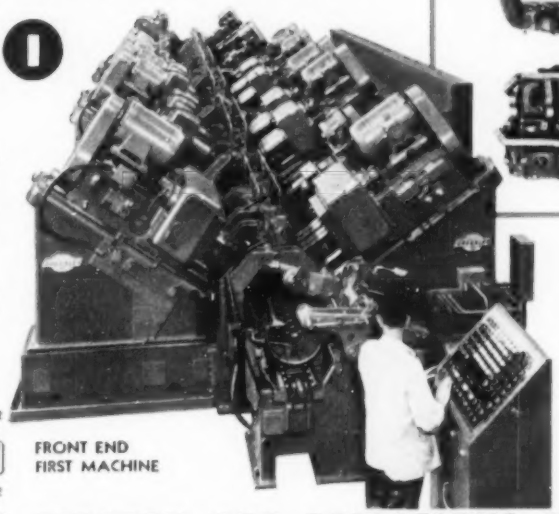
Two types available are hexagon swivel (H-S Series) adaptable to any type and length of screw, and swivel set (S-S Series) a socket-head screw with swivel shoe attached for use in restricted quarters.

Allied Air Parts, 662 N Robertson Blvd, Los Angeles 46, Calif

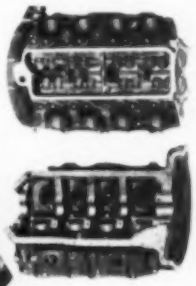
GREENLEE

TRANSFER MACHINES





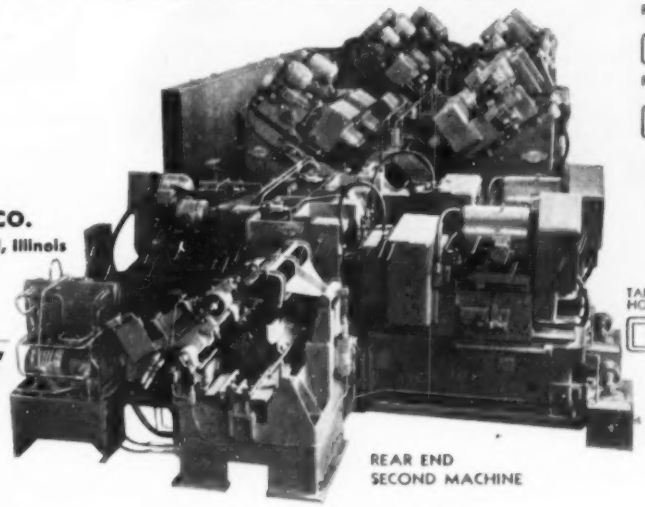
FRONT END
FIRST MACHINE



PERFORM 289 OPERATIONS ON V-8 CYLINDER BLOCKS AT 75 BLOCKS PER HOUR

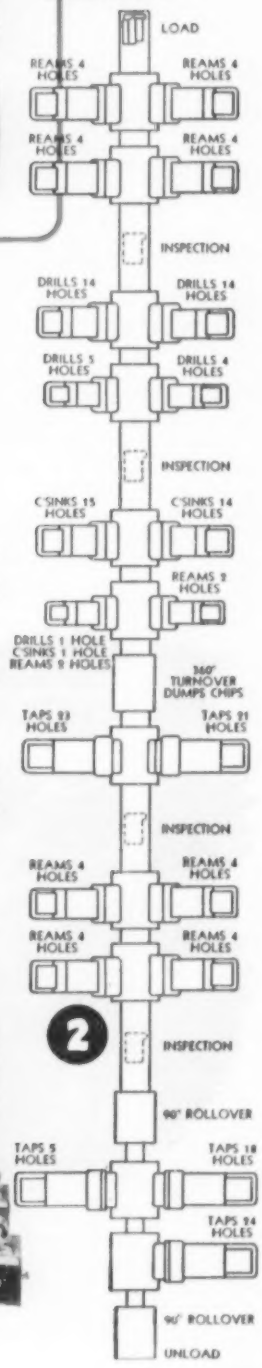
New tooling for a brand new V-8 motor includes three lines of Greenlee Automatic Transfer Machines similar to the units illustrated. Each 2-machine line performs 289 operations on cylinder blocks during a 45-second cycle.

Sound construction, proved engineering, and a background of experience in building special machinery that dates back to 1918 assure you profitable, trouble-free operation.



REAR END
SECOND MACHINE

NEW V-8 BLOCKS



GREENLEE BROS. & CO.
1723 Mason Ave., Rockford, Illinois

PRODUCTION MACHINERY
GREENLEE

Tomlee Disk Sander

Model No. 85 disk sander is a grinding and de-burring machine which can also be used for chamfering and rounding of corners. It is said to be particularly well adapted for getting into difficult angles.

The 10-in. unit is built from heavy cast iron with precision-machined and balanced face plate to eliminate vibration. The table is accurately ground and slotted to accommodate a mitre gage for the purpose of forming any compound angle up to and including 45°.

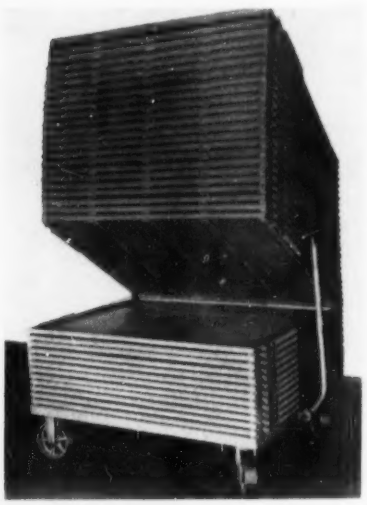
Table size is 15½x9¾ in.; height is 12 in.

Tomlee Tool and Engineering Co, Inc, Minneapolis 1, Minn

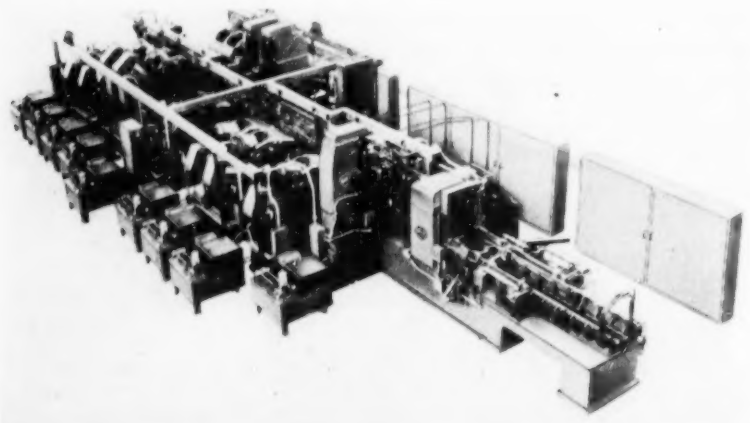
Yale Fork-Lift Straddle Truck

A rider-type, electrically-powered fork lift straddle truck, the Warehouser, is designed for right angle tiering in 5- to 6-ft aisles. It can operate in elevators and on flooring that will not sustain heavier rider-type trucks. Available in 2,000- and 3,000-lb models, it can lift loads to 133 in.

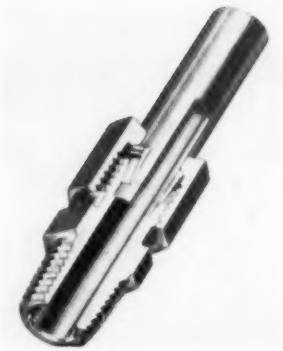
The Yale & Towne Manufacturing Co, 11000 Roselle Blvd, Philadelphia 15, Pa



MULTI-TIER TRUCK—For handling between operations, where materials should not make contact with each other, spring leaf truck has tiers individually hinged to the upright frame. Each leaf may be locked in semi-up position by two coil springs—*Rack Engineering Co, Connellsville, Pa*



NATCO HOLEWAY machine can complete 55 operations on engine blocks at the rate of nearly two parts per minute. Operations include milling, drilling, combination core drilling and chamfering, reaming, combination spot facing and chamfering, combination rough counter-boring and spot facing, rotating part 180° and vibrating for chip removal, and also inspecting the holes. Machine has 19 stations, requires one operator — *National Automatic Tool Co, Richmond, Ind*



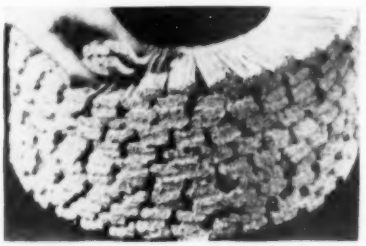
Positive-Seal Tube Fittings

Ermeto tube fittings are said to provide a more positive seal than flared or compression-type fittings, yet require no flaring, threading, welding, or soldering.

Fitting consists of a sleeve, nut, and tapered body; as nut is tightened, sleeve is forced forward into the taper of the body. Leading edge of the sleeve contracts, forcing the cutting edge to shear a slight groove into outer surface of the tubing, providing a leakproof joint between fitting and tube. Nut, pressing on the bevel of the sleeve results in a tight positive grip on the tube. Once the fitting has been assembled, the sleeve becomes permanently attached to the tube.

Available in carbon and stainless steels; in monel and brass on special order.

Weatherhead Co, 300 E 131st St, Cleveland 8, Ohio

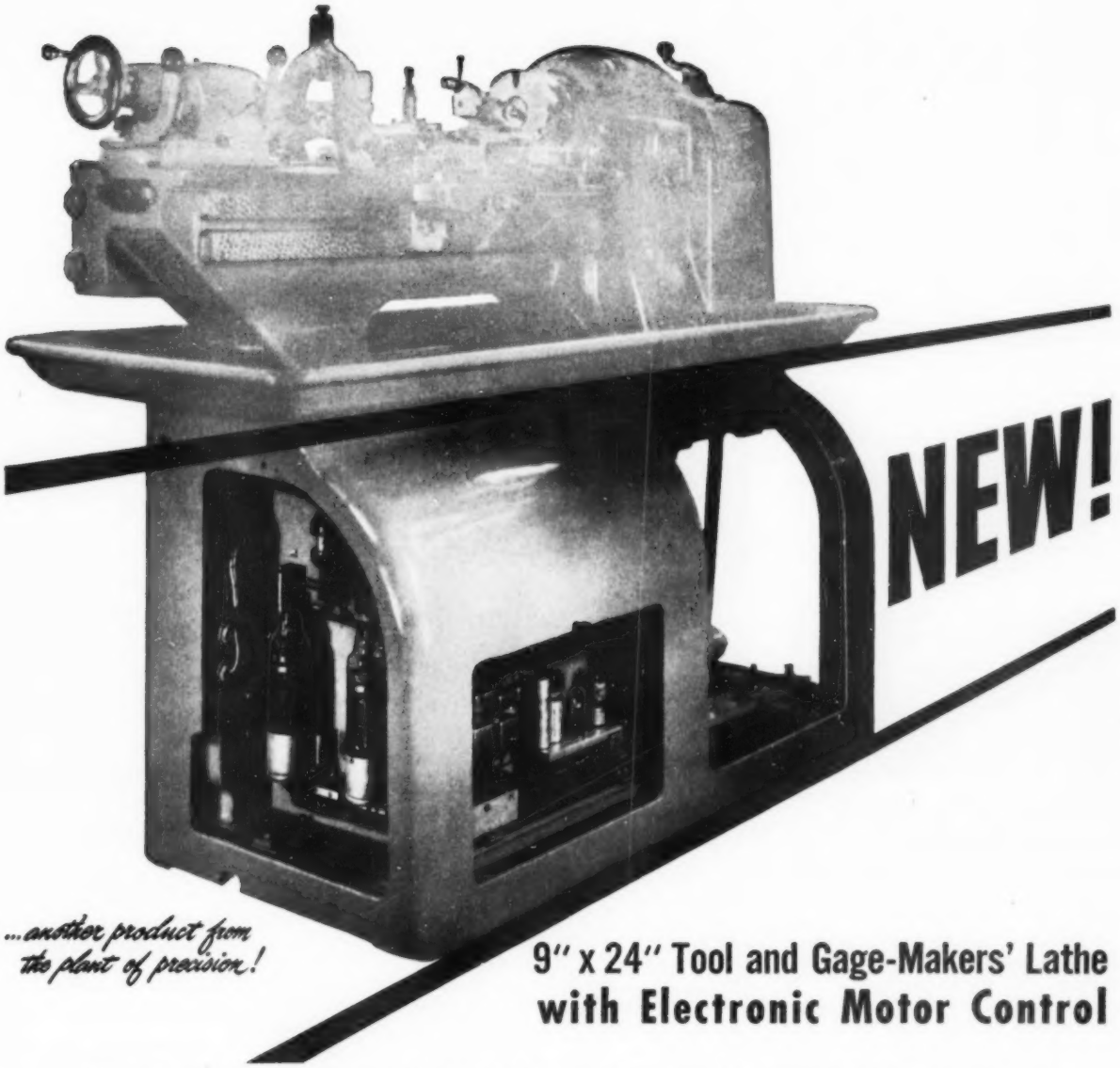


Sisal Buff for Curved Surfaces

The 20-RD sisal buff has extremely flexible fingers which make it particularly adaptable for work involving curved surfaces and recesses.

Twine is fabricated into each finger so that only raw ends of fibers are in contact with the work; cutting compounds are readily picked up and held, producing faster cutting action and longer wearing qualities. Available in all sizes from 6- to 18-in. dia, for both hand buffing and automatic machines.

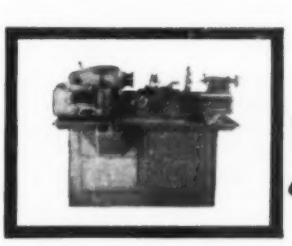
Geo R Churchill Co, Inc, 7501 Fayette St, N Quincy 71, Mass.



...another product from the plant of precision!

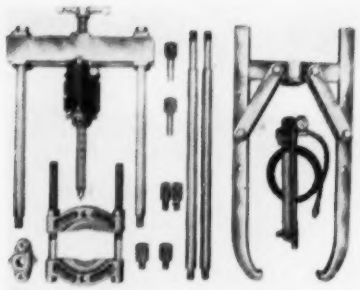
9" x 24" Tool and Gage-Makers' Lathe with Electronic Motor Control

Now you can have the advantages of quiet, simple, modern Hendey Electronic Motor Control on the Hendey 9" x 24" Tool and Gage-Makers' Lathe. These advantages include stepless spindle speeds from 25 to 3000 R.P.M. by potentiometer control of both field and armature of the 3 H.P. d-c motor. Exceptionally close speed control is obtained even under changing load. I.R. compensation gives full torque at low speeds over the complete armature control range. A full stop from maximum speed is accomplished in approximately 1½ seconds. Starting, stopping or reversing, even at 3000 R.P.M., is accomplished smoothly and rapidly. This new drive is optional equipment, and full information is available in our new 9" x 24" Lathe catalog. Write for your free copy! It gives full details on the new drive as well as other features of the Hendey 9" x 24" Lathe, which guarantee precision output with minimum effort.



MODERN Hendey

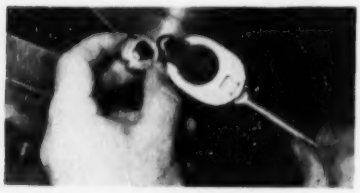
THE HENDEY MACHINE CO. INC.
MAIN OFFICE & PLANT: TORRINGTON, CONN.
BRANCH OFFICES: New York, Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco
REPRESENTATIVES: Philadelphia, Cleveland, Pittsburgh



50-Ton Industrial Puller Set

No. Y-285 industrial puller set for the removal and installation of gears, bearings, pulleys, wheels, pinions, and shafts includes a 50-ton hydraulic unit with suitable pullers and attachments. A three-speed hand pump or an electrically driven pump is available for use with the set.

Owatonna Tool Co, 383 Cedar St, Owatonna, Minn



Ratcheting Tool For Internal Wrenching Operations

Internal wrenching of Allen head bolts and screws, and Phillips screws can be accomplished with hex and Phillips screwdriver adapters snapped into the TAC open-end ratchet wrench. In addition, other TAC adapters will drive standard sockets, turnbuckles, plugs, and push rod housings. Torque handles can be used with all TAC heads, permitting instantaneous torque reading and accurate control without interrupting wrenching operations.

Several head sizes and various sockets eliminate need for extensive inventory; sockets are available in range from ⅜ to 4 in. in 1/16 in. increments in 64 sizes, enabling the device to do the work of an open-end, adjustable, box, socket, and ratchet wrench.

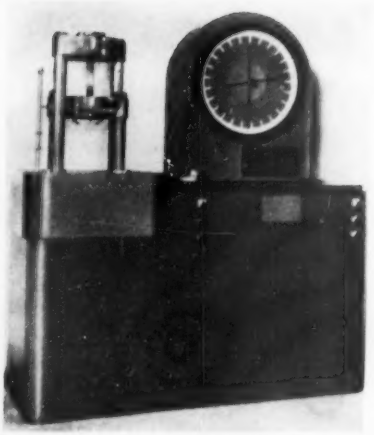
Tubing Appliance Co, 10321 Anza Ave, Los Angeles 45, Calif.

Polarized Welding Lens

An attachment for welders' helmets which contains two polarized lenses provides any shade of protection from 6 to 12. The operator rotates the cover lens to change the shade provided.

Thus, in welding on close work the lens can be set at a light shade until the arc is struck, then turned to provide greater protection. The attachment is said to be easily installed on most standard helmets.

Polacoat Inc, 9808 Conklin Road, Blue Ash, Ohio



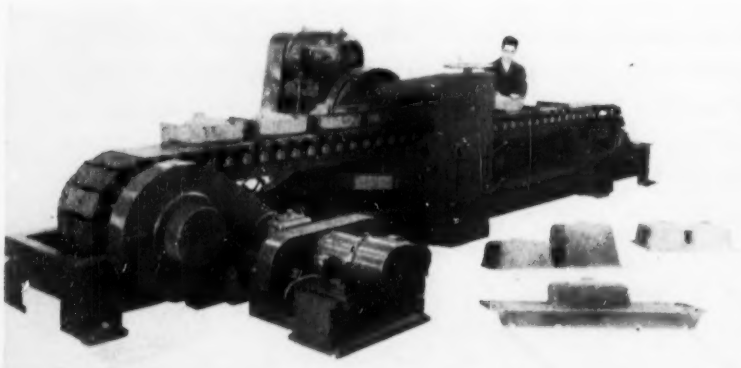
Baldwin Testing Machines

New models of universal Baldwin 60-H and 12-H testing machines, 60,000- and 12,000-lb capacity, incorporate three changes.

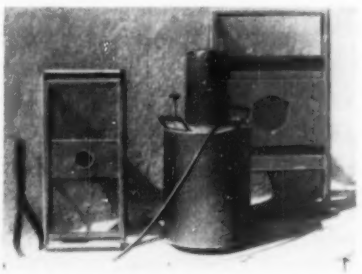
Clear space between columns has been increased from 10 to 15 in. Machine has been built as a single unit; separate framework for the gage panel prevents shock of breaking specimens from being transmitted to the load indicator. Both machines are available with either of two types of indicators: one with two precision Emery 16-in. dia indicator dials, the other with the Tate Emery indicator (TEG) with three ranges on a single 24-in. dial.

Loading speed can be varied infinitely between 0 and 2 in. per minute on the 60-H, and between 0 and 4 in. per minute on the 12-H. Both units are 67½ in. wide, and 27 in. deep overall; height of 77½ in. over the indicator.

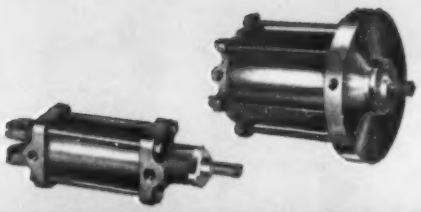
Baldwin-Lima-Hamilton Corp, Philadelphia 42, Pa.



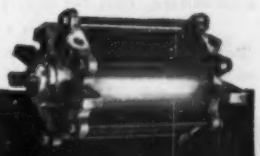
GRINDER FOR SINKS and lavatories, No. 836-36 in., has a chain-type conveyor carrying sinks and lavatories past the grinding wheel at a speed of 8 to 24 fpm. Grinding head mounted on ball bearing ways carries a 36-in. dia, 3-in. thick abrasive disk. Special hold-down supports the work while it passes the grinding wheel — *Gardner Machine Co, Beloit, Wis*



PORTABLE HYDRAULIC LIFT raises heavy motors, heaters, and condensers to a max lift of 8 ft 2 in.; minimum height is 33 in. for easy loading. No overhead cranes or hoists are needed. Opening air valve at base raises platform, and releasing air lowers it. 600-lb capacity unit retails for $840. — *Hamlin-Klock Corp, Pasadena, Calif*



Pneumatic Cylinders



NOW...

HANNIFIN HAS THE MOST COMPLETE LINE OF AIR CONTROL EQUIPMENT!

Really complete, the Hannifin line of pneumatic cylinders is made with two types of pistons . . . bores from 1" to 16" . . . six standard mountings. Really standard, these cylinders are tooled to tolerances that assure accurate mounting to make assembly to your machines easier. Really built, each cylinder is "TRU-BORED" and honed, piston rods are ground and polished, interchangeable end caps, heavy duty tie rods . . . rugged, yet precision construction throughout!

Write for Bulletin 210

NEW! REVOLUTIONARY HANNIFIN *P-M Pilot-Master Valves*

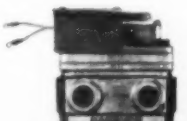
Piston-operated poppet design. Exclusive replaceable cartridge for easier maintenance. Speeds to 600 cycles per minute. Pressure from 15 to 150 p.s.i. Integral, solenoid-controlled pilot heads or a choice of 10 separate pilot valves for remote control.

- Fewer Valves to Stock
- Fewer Parts to Stock
- Maximum Interchangeability
- No Springs in Main Valve

Write for Bulletin 231.

2 and 3-Way Valves.

Same valve operates 2-way or 3-way, normally open or normally closed. ⅜" to 1¼" I.P.S.



4-Way Valves.

Two 3-way valves mounted in compact, common body. Two piston poppets. Two cartridges. ⅜", ½", ¾" I.P.S.

EXCLUSIVE REPLACEABLE CARTRIDGE

AIR WARDEN

Air filters, pressure regulators and lubricators to protect air operated equipment. Bulletin 10108.

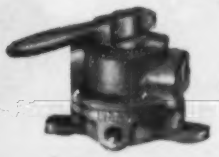
Disc Type Air Control Valves

Designed for smooth, positive and accurate control of air-operated equipment. Bronze discs lapped to perfect seal with seats. Packless design. For hand, foot or electrical operation. Sizes: ⅛" to 1¼" I.P.S.

Write for Bulletin 57-W

Hannifin "Directair" electrically controlled air-operated disc valve

Foot-operated treadle valve (Also spring return and rotary types)

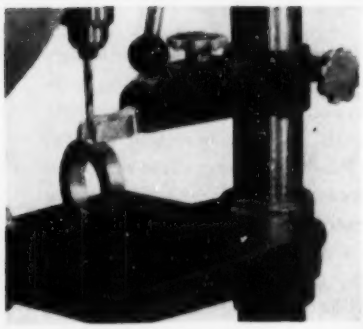


Standard hand control valve (Single or duplex)

HANNIFIN

Hannifin Corporation, 1117 S. Kilbourn Ave., Chicago 24, Ill.

Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves



Drillpress Clamp Holds Odd-Shaped Articles

The Sta-Put drillpress clamp has been designed to fit all models, and to hold securely any shaped object. It clamps directly on the column, and is quickly and easily adjusted.

The 3-lb unit eliminates need for C-clamps, vise, or V-blocks, reduces breakage of drills, and eliminates slipping. Tension is obtained by turning adjusting knob on top of clamp; pressure fork is adjustable from 7¼ in. minimum to 8¼ in. maximum from column.

Clark & Sawyer, Inc, 2012 E Seventh St, Los Angeles 21, Calif

Electric Vapor Degreaser

Wallace DG-1 portable, insulated degreaser is provided with either a 110- or 220-v heating element for instant plug-in operation.

Heating, which takes less than 20 minutes, requires only 2½ gal. of non-flammable Xsol solvent, which vaporizes at a high moisture-dispelling temperature. This, coupled with a hot-dip galvanized steel tank, minimizes rusting and corrosion problems.

Thermostatic control maintains a constant vapor level and prevents overheating. Flusher pump, lip-vent, 21-in dia work-baskets, and other accessories, can be easily attached.

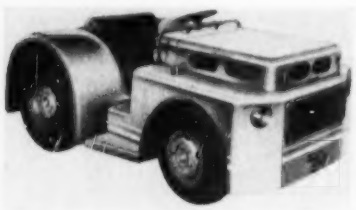
J D Wallace & Co, 132 S California Ave, Chicago 12, Ill

South Bend Pedestal Tool Grinder Has Increased Work Area

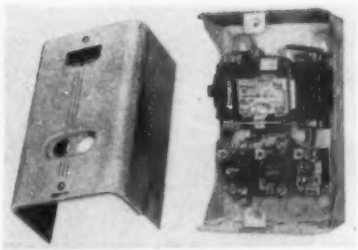
A new design of the pedestal tool grinder built by South Bend Lathe shifts motor down into the pedestal to protect it from abrasive dust and to provide greater work room around the grinding wheels. The grinder is available with ½-hp motor and 8-in. wheels or ¾-hp motor and 10-in. wheels.

The grinding wheel spindle is set forward on the pedestal to further increase the work room and allow more toe room for the operator. Two concealed lamps are mounted under each eyeshield.

South Bend Lathe Works, 425 E Madison St, South Bend 22, Ind



TOWING TRACTOR—Clarktor-120 has a drawbar rating of 12,000 lb. It is powered by a 16A 6-cylinder Chrysler engine developing 115 bhp at 3200 rpm. Equipped with a fluid coupling —*Industrial Truck Div, Clark Equipment Co, Battle Creek, Mich*



Cutler-Hammer Magnetic Starters, Contactors, and Relays

Line of magnetic starters, contactors, and relays incorporates a 5-unit construction designed for easier installation and longer life.

Wrap-around cover pulls off, fully exposing front and both sides of the unit for 180° accessibility. Five parts consist of 2 contact blocks, a magnet coil, an armature, and a 3-coil or 2-coil overload relay mounted on a steel panel. Each part can be removed from the front independently.

Three-coil, adjustable overload relay permits 4 ratings from each heater coil by changing position, providing protection within 3% of full load motor rating.

Cutler-Hammer Inc, Milwaukee, Wis

TRACTOR—Combination design permits operator to walk the tractor on short hauls and ride on long ones. Available with 12- or 18-v battery, with maximum speed of 3½ and 4½ mph, respectively. When operating handle is released motor is cut and brakes are set automatically—*Moto-Truc Co, 1974 E 59th St, Cleveland 3, Ohio*

Porcelain enamel bonded to aluminum produces a surface coating highly resistant to strong detergents, acids, alkalis, and sulfides, as well as thermal shock and impact. Can be applied over welds, and has electric and thermal insulative properties. Enameled aluminum can be sawed, sheared, drilled, and punched with minimum spalling of the coating.

Halrick, Inc, 31 Crosby St, Danbury, Conn

Announcing

ANOTHER OUTSTANDING ACHIEVEMENT IN METAL CUTTING SCIENCE

THE MILFORD REZISTOR

HIGH SPEED STEEL BAND SAW BLADE*

DEVELOPED AND MANUFACTURED BY

THE HENRY G. THOMPSON & SON CO.

As the original producers of the flexible back, carbon steel band saw blade, it was natural as well as inevitable that this Company would devote its skill, experience and resources to the development of a band saw blade made from a red-hardness, high speed steel.

Such blades have been developed. For the present the sizes manufactured are confined to ¾" and 1" widths with 6 teeth to the inch in tempers suitable for specific applications. They are designed for production cut-off work and particularly for cutting stainless steel and will be available in the several modifications.

Named after its great predecessor, the **MILFORD REZISTOR** Power Hack Saw Blade, the high speed steel band saw blade is now available for use on the band saw machines that are suited for this new blade.

The introduction of the **MILFORD REZISTOR** High Speed Steel Band Saw Blade will be on a rental-performance basis. Until the maximum performance of this new blade is made possible by the design of more efficient band saw machines the introduction of the blade will be under the control of the Thompson Engineering Staff. All rental sales will be made through our Distributors in conformity with our Statement of Sales Policy.

We welcome the opportunity to study your band saw metal cutting problems to determine which **MILFORD REZISTOR** High Speed Band Saw Blade will show potential cost savings in your particular cut-off operations.

*PATENT APPLIED FOR

STANDARD OF QUALITY THE WORLD OVER

THE HENRY G. THOMPSON & SON CO.

SAW BLADE SPECIALISTS FOR OVER 75 YEARS

NEW HAVEN 5, CONNECTICUT

PROFILE AND BAND SAW BLADES HAND AND POWER HACK SAW BLADES

Model BME-19 BURR-MASTER for helical or spur gears or splines.

This Burr-Master* gives you REAL VERSATILITY in gear and spline chamfering

Burrs and Chamfers Spur and Helical Gears and Splines

Note the complete chamfer produced by the Model BME-19 BURR-MASTER.

It is a simple matter to change over the Model BME-19 BURR-MASTER from burring and chamfering a spur gear to a helical or from a gear to a spline.

What is more, the Model BME-19 is amazingly fast, will completely burr and chamfer up to 5 teeth per second. Completely automatic, it does not require skilled operators. Machine never stops. Cycle indicator light tells operator when gear is finished.

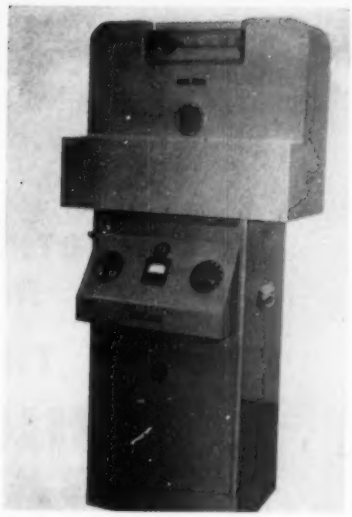
There is a BURR-MASTER to fit practically every chamfering requirement regardless of the type of gear or spline.

Ask for Bulletin No. 103-45

MODERN *Industrial Engineering Co.*

14230 BIRWOOD AVE. DETROIT 4, MICH.

*Reg. Patents applied for



Ultrasonic Degreaser

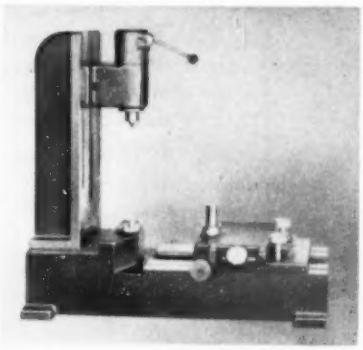
Circosonic cleaning machine uses ultrasonic waves to clean metal parts.

An ultrasonic generator is used in conjunction with vapor degreasing equipment to convert high-frequency electrical energy into mechanical vibration by means of a quartz crystal. Energy is transmitted up through the cleaning tank; region above the crystal is agitated, accelerating normal cleaning action.

Following cleaning, parts are rinsed by clean fluid and dried by a vapor process.

Generator is available for either the continuous production or batch-type method.

Topper Equipment Co, Clark Township, Rahway, NJ



Michigan Tool Rolling Fixture Checks Gears With Integral Shafts

Model 602-A rolling fixture checks size, eccentricity, and roll smoothness of cluster gears and others having integral shafts and centers. With scraped ways and hardened and ground ball ways, the fixture has a center distance adjustable from 2

H. J.
Here's a really fantastic letter!
P.W.

BANNER TOOL COMPANY

BANNER tools DETROIT — *Fine* TOOLS FOR INDUSTRY

17343 FILER AVENUE - TWINBROOK 2-4900

DETROIT 12, MICHIGAN

June 16, 1952

Cities Service Oil Co.,
3049 E. Grand Blvd.,
Detroit 2, Michigan
Attention: Mr. P. E. Watts

Dear Sirs:

We called upon the services of your lubrication engineer, Mr. A. J. Blake, in reference to a serious staining condition which we were having with our soluble oil. He analyzed this condition and recommended one of your Chillo Oils. This oil was tried and the rust condition eliminated to our satisfaction.

To our surprise on his next visit he was dissatisfied with our tool life and suggested we use a soluble oil called "Chillo A". Now not only do we have clean machines, but tool life has been increased 20%! While in our plant he asked permission to "look around", which, of course, was granted.

We were using a tapping compound with precision ground taps in order to hold to close tolerances. We did not consider tap breakage excessive but the removal of broken taps was sometimes rather expensive. He recommended we use "Chillo 10Z". Then came the surprise of our lives! With Chillo 10Z we have gone to commercial ground taps (a 300% savings) and can still hold our same tolerances, with a sharper thread, increasing tap life a minimum of 20% plus eliminating expensive removal of broken taps!

We also have a production stamping job which required a new set of dies every month. On his recommendation we tried Chillo 10Z with these dies. Now our die life has increased to at least two months...a saving in die life of 100%, disregarding labor costs. We also increased production 200% per die sharpening!

We tried the same oil on our broaching operation and found that instead of making two cuts we can get the same results now with one. We were using one of your competitors' hydraulic oils and you told us it was a "good oil" and would give us satisfactory performance. BUT, GENTLEMEN, WITH THE EXCELLENT SERVICE YOU HAVE GIVEN, PLUS THE TIME AND MONEY SAVED, YOU MAY REST ASSURED THAT ALL OF OUR LUBRICATING REQUIREMENTS WILL BE PURCHASED FROM YOU.

Yours very truly,

BANNER TOOL COMPANY

S. F. OLESAK

SFO:sd

(Advertisement)

For better grinding it's well worth having!

SIMONDS ABRASIVE CO.

Grinding Wheels

It's Simonds Abrasive Company bulletin ESA 191 "Cylindrical Grinding Wheels" with recommended specifications—plus facts about feeds, speeds and wheel sizes. It's part of a *complete* library on Simonds products including wheels for rough grinding, finishing, cutting off, sharpening . . . abrasive polishing grain . . . mounted wheels and points . . . surfacing segments . . . everything *you* need for productive, economical grinding, factually described and supplemented with helpful hints. Write for ESA 191 . . . or for information on Simonds wheels for other grinding jobs. We'll also send name of your Simonds distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON

DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

to 10 in. Maximum distance between centers on the overarm is 12 in.

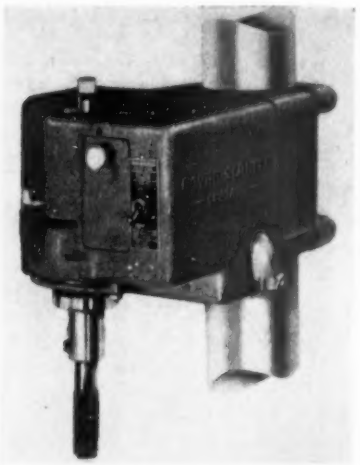
Gears to be checked are loaded between centers on the overarm. Correct tension with the master gear is maintained by spring-loaded ball ways. Turning the gear manually causes a 0.0005-in. indicator to show variations in size, eccentricity, and roll smoothness.

Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich

Hand Feed for Punch Presses

The Safeed for feeding strip and sheet stock for stamping or shearing will handle material from 0.001 to 0.125 in. thick. The feed is self-adjusting for various stock thicknesses within the range. The feed is designed to eliminate the danger of cutting hands and gloves on rough-edged metal stock. It can be adjusted for right- or left-hand feed.

Affiliated Machine & Tool Co, 260 West St, New York 13, NY



Tapping Head for Drillpress Produces Any Class Thread

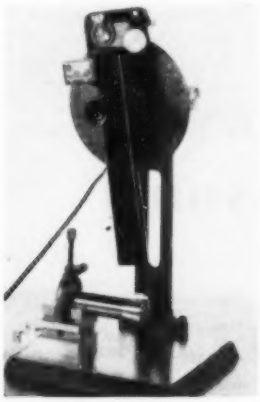
This lead screw tapping head, attached to an ordinary drillpress, converts it into a precision tapping instrument to produce any thread, including class 4.

Foot control switch frees hands for loading work; built-in reversing switch actuates drillpress motor, eliminating need for any inter-

mediate reversing device. Extreme accuracy in control of tapped hole depth is assured by electrically controlled switches.

All taps up to 7/8-in. dia are usable with standard adapter bushings; adapters are available on special order for taps from 15/16 to 2 in.

Boyar-Schultz Corp, 2124 Walnut St, Chicago, Ill



Collimator for Inspection

The G-12 goniometer collimator, (*AM* Nov 10, 53, p161) an optical device attached to machine tools or used for inspection purposes, measures angles to extreme precision, and is simple enough for ordinary shop operations. Collet and lathe tool angles can be easily checked, and bedway flatness can be measured to within 0.00007 in.

Self-aligning unit requires no calibration, is completely self checking, and eliminates necessity of jigs and fixtures. It can check an angle on a flat as small as 0.004 sq in., can set up an angle or surface using any plane surface as reference, even if surface is 20 ft away.

Safe Flight Instrument Corp, White Plains, NY

Marketeer tote trucks operate on electric power supplied by 8-hr batteries. Three-wheel design permits exceptionally short turning radius. Half-ton capacity unit has six speeds forward and reverse. Operating cost, including depreciation, is said to be not over 3 cents per hr used.

Electric Marketeer Mfg Co, Redlands, Calif

Quik-Label container markers stick fast to glass, metal, wood, plastic, or ceramic containers without moistening. They are made of strong cotton cloth, silicone plastic-coated to resist oil, grease, grime, and abrasion. Each

KELLER Air Tools

Speed TV Assembly

ANOTHER EXAMPLE OF

KELLER *Air Tools engineered to industry*

Keller Screw Drivers and Nut Setters, conveniently mounted in "scabbards" along the edge of the workbench, have reduced the cost of assembling these TV sets 50% or more.

FACTS IN BRIEF

ABOUT KELLER PNEUMATIC SCREW DRIVERS

Weigh less

Interchangeable parts

Consume less air

Wide variety of handles, gearing, torques, speeds

Need less "back-up" in the tool room

Reduce operator fatigue

Attachments, clutches, finders, and bits, for every purpose

Send for

FREE 36-Page Booklet

for more information and interesting ideas on air tool application

Keller Tool Company, Grand Haven, Mich.

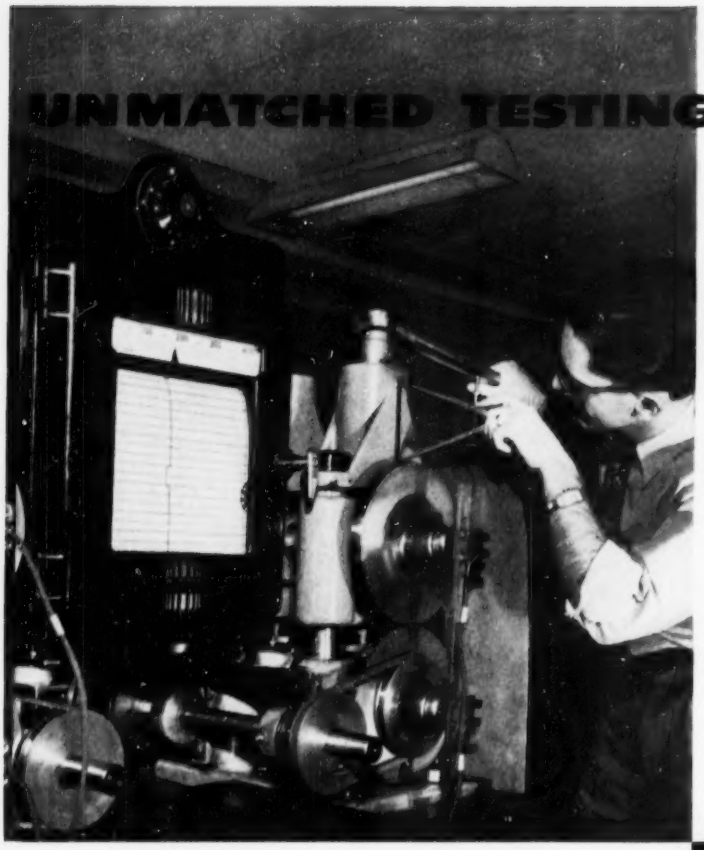
Please send me a free copy of your booklet on Pneumatic Screw Driving and Nut Setting Tools

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____



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In testing laboratory or manufacturing plant, Hyatt's facilities are second to none. Continuing research in methods and materials, and exacting inspection with the finest in modern equipment, has made the Hyatt name a synonym for "highest quality." That's why Hyatt Roller Bearings are so widely used in design applications involving radial loads. Design engineers know that Hyatt bearings have been "performance-proved" for smoother, trouble-free operation and longer life. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

marker is printed with precautionary instructions; space is provided for a self-sticking insert with name of hazardous material. Starter strip releases markers for replacement.

W H Brady Co, 727 W Glendale Ave, Milwaukee 12, Wis

Rust-inhibiting paint, called SRP (sure rust prevention) outlasts red lead and costs 1/3 less. Heavily-rusted metal can be wire-brushed to remove heaviest scale and then painted. SRP penetrates the rust and chemically inhibits further formation. Strongly resistant to acids, alkalies, or salts, and is said not to crack with expansion and contraction of metal.

L Sonneborn Sons, Inc, 80 Eighth Ave, New York 11, NY

Flex-Flo safety hammers and handdrifts are now being coated with Slipruf to provide a friction surface said to be grease- and perspiration-proof. The non-skid coating acts as a safety factor and reduces fatigue, since less muscular effort is required for a secure grip.

Custanite Corp, Larchmont, NY

All-purpose stacking box is available with reinforced corners and drop handle at each end. It is of spot-welded construction, equipped with four rivets for extra strength, and continuous stacking rim on all four sides.

Bay Products, Inc, 3009 N 16th St, Philadelphia 32, Pa

Steel work stand has two legs formed by a single steel angle running across the top of the stand for added rigidity. Trays with a 2-in. flange running along back and sides have turned down forward edges for easy cleaning. Eight models, with or without drawers or casters, two or three trays, measure 32 in. high; drawers are 18x16x5, and trays are 16x26.

Industrial Bench & Equipment Manufacturing Co, Inc, 97 South St, New Britain, Conn

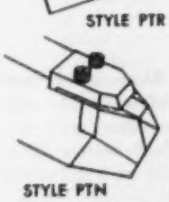
Dipblack immersion process for all ferrous metals produces a uniform finish on any assembled unit consisting of different types of iron and steel. Does not affect dimensions or surface texture, will not chip, peel or scale during or after welding, bending, punching, stamping, or rolling. Treated metal is resistant to alkalies, solvents, or high temperature.

Special Chemicals Corp, 30 Irving Place, New York 3, NY

HERE'S THE TOOL *that fits to a*

STYLE PTL

STYLE PTR


STYLE PTN

The right angle chucking lathe, tracer controlled, provides for efficient profile machining of workpieces having large diameter, short length, and thin wall sections, particularly those made of stainless steel and heat-resistant alloys.

To complete the set-up, an appropriate cutting tool is required. It must be shaped to accurately follow the lead of automatic control, face up to the job, and cut corners with maintained precision.

For this very purpose a Kennametal tool has been designed. The mechanically-held triangular insert, seated in a hardened V trough, provides a sturdy design in a 50° nose angle tool that will withstand lateral thrust, and can be modified to smaller nose angles and radii as required by specific profiling conditions.

Four shank sizes are available in three different styles — righthand, lefthand, and neutral, as illustrated in the sketches. See Catalog 52, page 45 for specifications. Confer with our Tool Engineers if you need help in this type of tooling—or any other. Kennametal Inc., Latrobe, Pa.

KENNAMETAL

CEMENTED CARBIDE TOOLING THAT INCREASES PRODUCTIVITY

since 1931

EFFICIENT USE OF ENGINEERING MANPOWER

There is a sound reason behind the enormous growth of America's independent engineering industry.

Led by Pioneer since the 1930's, the industry has not only made possible more effective and efficient use of America's engineering manpower, but it also brings each day new blood, new ideas, new and better techniques to America's industrial plants.

With Pioneer as its leader it has become the key to America's constantly expanding "production know-how".

Pioneer ENGINEERING & MANUFACTURING CO., INC.

19643 JOHN R STREET
Detroit 3, Michigan

Lightweight Saf-Hed-Hat, made of fiber glass, will not split, crack, or deform. Meets ASA code for dielectric breakdown, and exceeds code for impact resistance. Cradle can be quickly and easily adjusted to fit all head sizes.

US Safety Service Co, 1215 McGee St, Kansas City, Mo

Hudson standard cases and covers are available in a complete line of sizes ranging from extra large to miniature, including square, round, and rectangular shapes. Cases made of aluminum, brass, copper, or steel, may be had from 16x10x7½ in. to 11/16x11/16x1 1/16 in.

Hudson Tool & Die Co, 118 S Fourteenth St, Newark 7, NJ

GA model toolholder has increased body dimensions for holding any diameter from 1/16 to ¾ in. Shank and V-jaw sections are permanently parallel within 0.0005 in. in 6 in. Adaptable for all kinds of turret lathes, drilling, cutting, and reaming, units are also useful for accurate positioning of second operation work. Will hold any shaped tool or toolbit within wide holding ranges, and provide simplified setup for boring, end forming, and knee-turning.

Brookfield, Inc, 755 Boylston St, Boston 16, Mass

Self-locking fastener, particularly suited for securing water- and gas-tight casings, requires no special tools for operation; enlarged head can be readily grasped in the hand. Small wire form replaces usual receptacle or spring, so that very little mounting space is required in the supporting frame or casing. When fastener is closed, casing is held in tightly sealed position by a pair of springs carried in the head.

Dzus Fastener Co, Inc, Box 185, Babylon, NY

Lightweight, glass fiber insulation material, called Ultrafine, is fire- and mold-resistant, is resilient, and resists vibration. Available either plain or faced with any one of 5 different types of vapor barrier facings, or die-cut to any shape. Can be cut with a knife or shears and easily applied to all types of heated and cooled equipment within the temperature limits of the material, 450 F. Held in place by adhesives, wires, staples or twine. Manufactured in 6- to 72-in. wide rolls, from ½ to 1½ in thick.

Gustin-Bacon Mfg Co, Kansas City, Mo

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This is a major reason why Pioneer can so consistently cut both cost and time of re-tooling, improve product designs for easier, lower-cost manufacture and devise new techniques that lower the break-even point.

Pioneer ENGINEERING & MANUFACTURING CO., INC.

19643 JOHN R STREET
Detroit 3, Michigan

ROUND TABLE Discussion

PIGS IS PIGS

How much responsibility has a machinist for keeping his work area in reasonably clean condition? Is this completely the sweeper's job, or will an able worker naturally tend to keep his territory orderly?

IS THE INDIVIDUAL responsible for his work area, or should it be left to the sweeper? Both are morally responsible for shop cleanliness, and the sweeper, of course, is paid principally for cleaning up.

I don't think one would be justified in insisting on the skilled man doing sweeper's work, but skilled men are not justified in being unnecessarily dirty workers. Very few machinists could reasonably object to clearing their feet, that is, sweeping the floor on which they walk and stand while operating the machine.

At many machines, notably large planing, slotting and horizontal boring machines, etc, metal chips will fall on the floor, and he would be a lazy machinist indeed who would prefer to destroy good shoe leather by walking on steel cuttings, in preference to taking a brush in his hands and giving the floor a sweep round. By keeping his feet clear he would likewise be adding to his foot comfort and operating convenience.

The foregoing refers in general terms to all types of heavy machines on general production work. On medium-size and light machines much the same applies, with certain modifications. Much of the stock removed in the light-machine sections comes off in the form of swarf which is more easily handled and is less likely to spread around. Nonetheless, when the worktables get littered with swarf, it becomes necessary for the operator to remove this material if the cutting tool is to continue cutting.

In the light machine sections in some plants, bins are conveniently placed so that the operator can rid his machine of swarf and at the same time keep the floor space relatively clean and tidy. Again ,in many machine shops, bins sit on trucks ready for the sweepers to wheel away, when full, to rail-wagons, trucks, or central bins of large holding capacity, specially provided for collecting scrap material prior to dispatch. This is an excellent idea which reduces cleaning up to a mini-

MEASURE IN MICROINCHES RMS

from **BLUE PRINT** *to* **FINAL MILLING**

the JEFFREY MANUFACTURING CO. *depends on* **the PROFILOMETER**

The Jeffrey Manufacturing Company of Columbus, Ohio is the largest plant of its kind in the world manufacturing mining, processing and handling equipment. From the first stage of manufacture of this equipment the Jeffrey Company relies on the Profilometer.

At Jeffrey, the Profilometer is used to establish precision surface specifications from the blue print stage of parts manufacture to the actual holding of precision surface measurement at the machine in the shop.

In the above illustration the Profilometer is shown checking the surface finish of idler gears after hobbing. These gears are used in the lower gear housing of Jeffrey's famous continuous mining machine, the COL-MOL, and must be held to a surface finish of 50 microinches or less. With the Profilometer on-the-job surface measurement is possible in seconds assuring constant quality control and eliminating the possibility of costly rejects due to improper surface finishes.

To be *sure* of precision surface measurements, plants throughout the world are relying upon the Profilometer today. In your production and inspection departments you also can obtain the exceptional advantages of the Profilometer as an important shop tool.

To learn how the Profilometer can help cut costs in your production, write today for these free bulletins . . . Practical Operating Features of the Profilometer; How to Specify Surface Roughness And Why.

Profilometer is a registered trade name.

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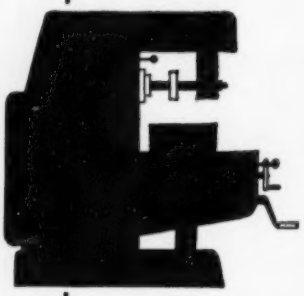
production begins with



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No tools like the right tools! Columbus Die-Tool designs and builds tools, jigs, fixtures and special machinery to meet your most exacting requirements. RESULTS: operating cost that matches your budget; production that matches your schedule; product quality that matches the demands of your market.

Contact Columbus Die-Tool & Machine Co. first—when you have a special machine problem. They are nationally known as expert designers and builders of special machinery and equipment . . . have been for over 46 years.

Columbus Die-Tool
AND MACHINE COMPANY

P. O. BOX 750 • COLUMBUS, OHIO
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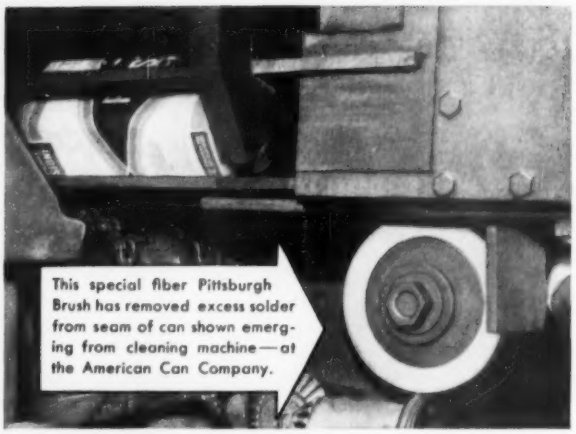
Manufacturers of
JIGS • FIXTURES • BUILDING MACHINE TOOLS COMPLETE
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS


This special fiber Pittsburgh Brush has removed excess solder from seam of can shown emerging from cleaning machine—at the American Can Company.

"Wouldn't be without them!"
say the men who use . . .

Power-driven Pittsburgh Brushes for longer life, better work!

Last longer, much safer—Cloth brushes formerly used at the American Can Co., Jersey City, to wipe excess solder from can seams lasted less than an hour, occasionally caught fire. Switching to special fiber Pittsburgh Brushes, American Can now gets better than 15 hours life per brush and the fire hazard has been eliminated. Supervisory personnel reports: "We wouldn't be without them!"

Last longer, do better job—In producing wall and ceiling panels, at the Barclay Manufacturing Co., New York City, dust caused by routing "mortar lines" settles on the panels, must be completely removed before panels can be bake-finished. Brushes originally used had a short life span, wore unevenly, and did so poor a job that many baked panels had to be completely refinished to pass inspection. Since even a "fairly good" brush would not do, Barclay searched for the "perfect" brush—and chose Pittsburgh! Result: Better work, and costly refinishing eliminated.

Last longer, better constructed—The Windalume Corporation, Kenvil, N. J., manufacturers of aluminum windows, uses Pittsburgh wire brushes to remove burrs caused by milling. The wire bristles on the brushes used formerly broke off easily. Windalume replaced them with Pittsburgh Brushes because they are better constructed—and Pittsburgh Brushes last longer!

WRITE TODAY FOR FREE BOOKLET!
Write today for a free copy of our booklet that shows, through actual case histories, how Pittsburgh can help cut *your* brushing costs. Address: PITTSBURGH PLATE GLASS COMPANY, *Brush Div.*, Dept. W-9, 3221 Frederick Ave., Baltimore 29, Md.

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Power Driven
BRUSHES
BRUSHES • PAINTS • GLASS • CHEMICALS • PLASTICS • FIBER GLASS
PITTSBURGH PLATE GLASS COMPANY

mum and which has another and vitally important feature to recommend it. It is selective, and prevents unlike metals from being piled together. Selected scrap, of course, fetches a higher price than miscellaneous junk.

Unclassified scrap can be responsible for many headaches. I had once to pass a repair bill for approximately one thousand pounds sterling as a consequence of careless scrap storing and the stupidity of a general laborer employed in a shipbuilding yard. When shearing the edges of ships' plates, say, 20 ft long by $\frac{5}{8}$ in. thick, the shearings come off the plate in strips about 6 ft long by $\frac{5}{8}$ in. square. This 6-ft of length of shearing from a plate 20 ft long is achieved by notching the plate at 6-ft intervals before shearing. Notching is carried out at punching machine after the plate has been marked off, and is the forerunner, in shearing, of the modern chip breaker, currently in use on carbide cutting tools; it breaks the cut into lengths convenient for handling. Some scrap purchasers ask for those 6-ft lengths to be cut into 9-in. lengths and it is usually the job of a general laborer to cut them at the nearest available shearing machine. Among some shearings, an inch-square file had found its way and the laborer, without noticing the difference, attempted to shear it in two. The machine stalled and the impetus of two heavy flywheels broke the 12-ton main frame in two parts. If the loss in production through waiting for a new main frame be taken into account, the cost of shearing that square file would have been much higher than one thousand pounds sterling.

Can a foreman properly insist that a man do other than the work he was hired for? This question raises wide issues. There's nothing in a name, and machinist, erector, plumber, blacksmith, are merely convenient generalizations — descriptive

"I've spent 432¾ man hours trying to attract his interest, and still he pays no attention to me."

OUT OUR WAY

MAKIN' SKATES ON COMPANY TIME, HAH! OKAY, LET IT END THERE! DON'T LET ME KETCH YOU TRYIN' TO MAKE A RINK TO GO WITH 'EM!
I CALL MAKIN' SKATES COMPANY BUSINESS! YOU NEED 'EM AROUND HERE WITH THESE OILY, GREASY FLOORS!
YEAH -- SOMEONE OUGHT TO TELL TH' BOSS ABOUT SOL-SPEEDI-DRI!
MACHINE OIL
J.R.WILLIAMS
THE UNDERCOVER ARTIST

Tops the field— in sales and value!

SOL-SPEEDI-DRI

"Dry cleaning" with Sol-Speedi-Dri is industry's favorite way to keep floors clean and slip-proof. Sol-Speedi-Dri is the largest selling oil and grease absorbent in the country. That's because pound for pound, dollar for dollar, it gives you *more for your money*, all factors considered. You can count on consistent quality, too—careful laboratory controls see to that. Send coupon today for free sample and literature.

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Warehouse stocks maintained in principal cities of the United States and Canada.

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Inquirers in New York, New England, and New Jersey should write to Speedi-Dri Corp. Elsewhere in U.S. to Waverly Petroleum Products Co., 1724 Chestnut St., Phila. 3, Pa. In Canada, G. H. Wood & Company Ltd., Toronto. Branches throughout Canada.

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Faster assembly . . . no more failures of fasteners. GREER STOP NUTS hold firm against jolts, shocks, shimmy, wobbles . . . any vibration, any kind.

Bolt threads are gripped tightly . . . these famous nuts *never* work loose. Yet an ordinary hand wrench gives instant release. The tough, built-in GREERCOID collar does it . . . and seals against fluid leakage, too!

Study *your* fastener problem. Over 3000 types and sizes. Consult GREER. Proved on thousands of products. Meets gov't and military specifications.

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GREER STOP NUT CO.
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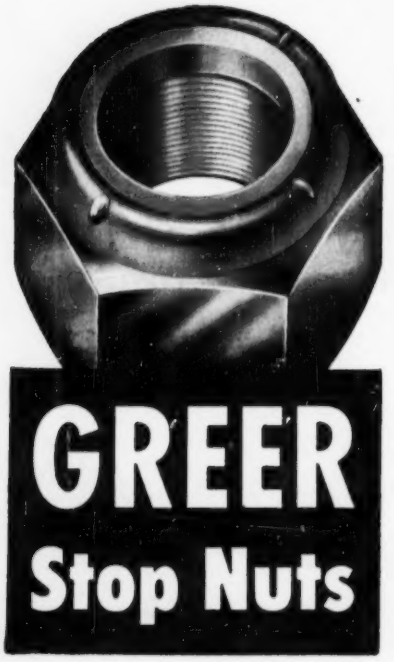


terms to be used as a means of identification

What is a machinist hired to do? Obviously, to work a machine which, I should say, includes keeping the machine cleared of cuttings, keeping it clean and well oiled and keeping it reasonably tidy. In order that the cutting tool may efficiently do its work, it must be kept reasonably free of cuttings and swarf; this is surely the work of the machinist and, strictly speaking, cannot be called machining. Ed surely does not advocate that each machinist should have a mate—like the music-hall plumber—who would act as a glorified wet nurse to him. Besides, most machinists have time and to spare when a cut is on, to tidy round and that should be regarded as work he is hired to do.

At some light machines on short-operation work, the machinist is not so well placed in the matter of easy time, and an exception might well be made here. In such cases it might be arranged for sweepers to be in fairly close attendance; it's all a matter of common sense. On machines where conditions permit of a little tidying during cuts, it is only laziness, *not* dignity, that keeps the operator from taking a pride in his machine and *immediate* surroundings. This is not to suggest that he go cleaning half over the factory, however much easy time he may have.

Terms like machininst, blacksmith, etc, are relative and cannot be regarded quite literally. Blacksmith might *almost* be regarded literally, because he has a striker to attend to all the non-blacksmith work called for in a smithy, but what of the striker? Cleaning out the smith's fire, huntings for tongs, charring the fire, cannot be called striking but are included in the duties a striker is hired for and paid to do. The joiner at his bench clears his bench and feet of shavings, as a matter of course, and the typist keeps her machine and types clean, and renews the ribbon when necessary; those jobs could not be called typing, although she is hired as a typist.

Let's look at sport for a moment. What of our footballers? Being strictly literal here would produce some queer results. The goalkeeper could not play the ball with his hands, because he is a *footballer;* there would be no shies—throw-ins—and none of the players would be allowed to use their heads—in the physical sense, of course.

No, Ed, I vote for Al and common sense, and repeat it is not dignity or craft-pride which prevents a machinist, with easy time on his hands, from tidying round; it's more like laziness and craftiness and a *lack* of the true dignity of labor, not to say cleanliness.

I don't think it would be wise for a foreman to *insist* that a man do other than the work he is hired for, neither do I agree that local, nominal cleaning comes under that heading. It often happens that a man will be called on to do work which, in a sense, might not properly be regarded as his work and it is the foreman's job to decide on the method of approach. His knowledge of the mens' make up will guide him, but if the man is a newcomer, politeness is the most likely card to play. If that approach fails, the addition of a little firmness might help matters, according to the nature of the man. When possible, the truculent

"Hereafter, I'd appreciate it if you'd stop calling me by my initials—and referring to me as old!"

Bridgeport

TURRET MILLING MACHINES

continue to make other methods obsolete

NO matter how you figure it, today's work cannot be handled economically on yesterday's machines and old-fashioned tooling. . . . In terms of speed, accuracy, convenience and costs, obsolete methods are a liability . . . never an asset.

How are your machines dated . . . '52 . . . '42 . . . '32 . . . or what? Can you mill, drill, bore or shape . . . at all angles of the work . . . without changing set up?

We suggest you investigate the advantages offered by "BRIDGEPORTS" and compare the possibilities with what you are trying to accomplish on existing equipment. Once you've done this, you'll do what countless other shops are doing . . . and replace obsolete machine tools with modern, proved BRIDGEPORT TURRET MILLING MACHINES.

(Left) *Light Duty* . . . for right angle milling and drilling narrow, deep molds and cavities.

RIGHT ANGLE ATTACHMENTS

(Left) *Heavy Duty* . . . for milling and drilling at right angles. Fits both Master and 1 HP Bridgeport Heads.

MILLING MACHINE VISE

An improved vise providing great gripping power. Streamlined for attractiveness and equipped with coolant trough. Rigid holding through screw of large diameter. Made in two sizes: 5"x3½" and 6"x5" jaw openings.

NO. 2 BORING HEAD

Boring Tools and Holder provide the means of boring holes up to 6" diameter. Available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.

Condensed Specifications

- 8 Spindle Speeds . . . from 80 to 2720 RPM.
- Back Geared Spindle Drive Unit: utilizes full power at all speeds without belt slippage.
- Power Feed to Quill: 3 steps . . . .0015, .003 and .006 in. per spindle revolution.
- Quill Travel: 5".
- Spindle Brake and Lock for convenience in changing tools.
- Collet Capacity: up to ¾" diam.

Bridgeport MACHINES, INC.

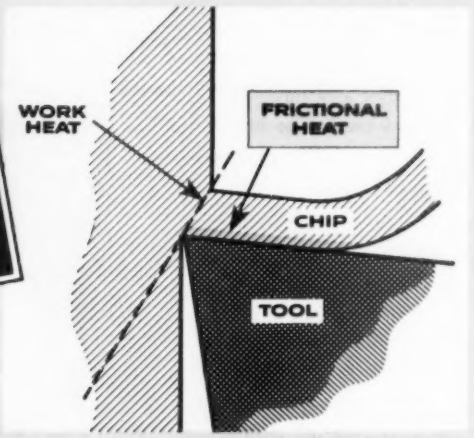
Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

NEW! A coolant that reduces frictional heat!

JOHNSON'S #130 WAX-COOL

Water-type WAX coolant



Because of wax's greater lubricity, Wax-Cool effectively attacks *frictional heat* which develops at the tool-chip interface. Wax-Cool also has the heat carry-off properties of ordinary coolants—to disperse *work heat* generated in the shearing zone.

Johnson's Wax-Cool is the first water-soluble coolant to introduce ***real lubrication*** between tool and chip, thereby attacking frictional heat at its source.

Developed by the makers of Johnson's Wax and thoroughly tested in leading production shops, Wax-Cool not only disperses ***work heat*** generated at the point of shearing . . . it minimizes the more troublesome ***frictional heat*** generated at the tool-chip interface. (It is an accepted fact that, as cutting speeds rise, friction between tool and chip becomes by far the principal source of heat.)

Because of wax's polar attraction for metals, Wax-Cool *stays with* tools and works even under high heat and pressure, preventing chip weld and reducing frictional heat far more effectively than water-soluble coolants have ever been able to do.

Wax-Cool's ability to reduce frictional heat means: Far greater tool life . . . improved finish . . . increased production.

WAX-CUT...new wax-type cutting oil

Johnson's Wax-Cut brings all the lubricating and heat-dispersing benefits of special waxes to automatic screw machines, gear cutting machines, and other equipment calling for cutting *oils.*

A TEST IS YOUR BEST PROOF!

Hundreds of production shops across the country are already benefiting from the improved lubricating qualities of these specially blended waxes. A test of Johnson's Wax-Cool or Wax-Cut in your own machines will show you standards of performance and economy you never believed possible.

For all the facts, get in touch with your local Johnson distributor, or write now to:

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S. C. JOHNSON & SON, INC., RACINE, WISCONSIN

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PROSPERITY IN THE USA: How Deeply in Debt Are We?

How prosperous *are* the people of the United States? Previous messages in this special series have answered this question in part by recording the progress—relatively slow progress—we have made in increasing both the income and the wealth per person in the USA.

This fourth and concluding piece of the special series deals with the extent to which our prosperity should be discounted because it has been accompanied by an increasing volume of debt. Many correspondents have suggested to us that an individual or a nation can temporarily increase prosperity by borrowing, but in so doing lives on both borrowed goods and borrowed time. Our purpose here is solely to throw light on the question of whether or not we are now in that unenviable position.

On January 1, 1953, the total debt of the United States government and of its citizens was $627 billion, as shown in the table below. On its face, a debt of this magnitude, which represents about $3,900 of debt for each person, suggests that we are heavily debt-ridden.

TOTAL DEBT – PUBLIC AND PRIVATE

Federal government debt	$267 billion
State and local debt	30 "
Private debt	
Corporations	195 "
Individuals	135 "
	$627 billion

The burden of our debts, however, does not depend simply on their size. It depends in much more decisive degree on our capacity to carry the load successfully. This capacity, in turn, is partly a matter of attitude, and attitudes defy objective measurement. A community that gets very jittery about its debts has less capacity to carry its burden successfully than one that does not. But the accurate measurement of jitters, present or prospective, still remains to be mastered.

Capacity to Carry the Debt Load

Nonetheless, it is possible to throw some light on our capacity to carry the debt burden by studying key economic elements that can be measured with some degree of accuracy. The following paragraphs indicate how some of these key economic elements stand.

Compared with our national income, the total volume of our debts, public and private, is still well below the level of 1929, when it proved to be too big for the good of the country. Our total debt is now 113% greater than the national income whereas in 1929 it was 146% greater.

There are several other cheering facts about our debts. One is a sharp decline in interest rates which makes the cost of carrying our debts relatively much less than it was in 1929. It took 8% of our total national income to carry our debts in 1929; it takes only about 5% of the income today.

More Cheering Facts

We also have much more ready cash now than in 1929. Today individuals and corporations hold a total of $269 billion in cash or its equivalent which is almost twice as much as the portion of private short-term debt (about $140 billion) that is subject to sudden demand for payment.

Many students of the subject cite the relatively low cost of carrying our debts and the large volume of cash on hand, and reach the comfortable conclusion that our debt burden is nothing to worry about. In further support of this view they emphasize the fact that no important part of our debt is owed abroad. Hence, they reason there is not the danger, so conspicuous in Britain since the end of World War II, that our economy will be upset by the necessity of making heavy debt payments to other countries.

Some Dangers of Present Debt

However, the nature of our debts presents dangers that it would be foolish to ignore. This is true of both the debt of $267 billion owed by the federal government to its citizens and the $330 billion in private debts owed by some citizens and corporations to others.

Public debt can be a dangerous kind of debt because government has the power to print money or to create its equivalent by expanding bank credit. Of the $215 billion that the federal government borrowed during World War II, over $90 billion was borrowed from banks. This was the largest single contributor to the inflation of prices that since the war has robbed the dollar of about half of its purchasing power, and thereby robbed the buyers of government bonds of about half the purchasing power these bonds were supposed to represent.

If, as is quite possible, a new emergency should again require the federal government to borrow heavily while its debt remains so high, it is doubtful that the public would be avid to buy its bonds. Hence, the government might again be forced to resort to the inflationary process of relying on bank credit.

Private debts can be dangerous if the people take on new debts more rapidly than is justified by the growth of business or by their ability to repay. Last year bank loans were increased by the imposing sum of about $6½ billion, which represents an increase of about 11% in total loans outstanding. This is almost twice as much as the increase in the volume of business over the same period. Installment credit for consumers increased by $3 billion last year, again an increase in debt about twice as great as the increase in business volume in the fields where the credit was used. It is also the fastest rate of such growth in our history.

Constructive Use of Credit

So long as the expansion of credit does no more than keep pace with expansion in the volume of business, the expansion is constructive. Also, when credit is expanded to acquire resources and equipment that will enlarge the volume of business a little later, that use is clearly constructive. But when private credit expansion begins to run ahead of business growth, it is time for us to be heads up. Such credit expansion courts price inflation. It also creates a forced draft under business so that, if credit is cut off, there may be a painful drop.

To give a summary answer to the question: *Is the level of debt in the United States a danger to our prosperity?* — the answer seems to be, "Not at the moment." We owe nothing abroad. The interest burden on present debt is relatively small, and we appear to have the resources to handle the short-term debt. Yet both the total amount of debt and the recent rapid increase in total private debt, especially the latter, are enough to signal for caution. We need restraint on the part of business and consumers to avoid expanding private borrowing at an excessive rate. The federal debt needs to be reduced and put in more manageable form. If these things are done, we can proceed to build a sound prosperity.

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type should be avoided on such occasions; most of them just need an excuse to become awkward and *insisting*, on a weak hand, would probably put the cat among the pigeons. Ignoring the dour ones in such circumstances denies them an opportunity to become objectionable.

M Donald
Lanarkshire, Scotland

•

COLOR BLIND

How important a factor is color in the shop? Will it improve productivity and safety, even if space and lighting conditions are not ideal? Readers say . . .

I WONDER IF Al is getting behind the forward march of things when he cannot see the advantages of brightening up dark machines and corners with a little paint. If he wants to stick to the old black finish he is certainly slipping behind times. I don't think he's a keen observer on the point, and any foreman should be a keen observer on all points around him.

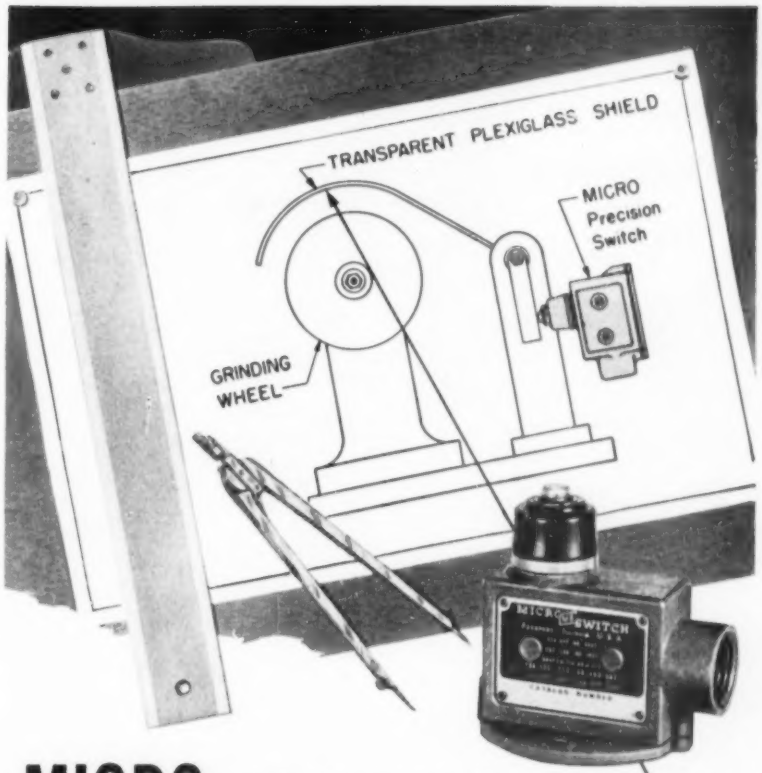
It reminds me of a conference Mr Ford had with his distributors many years ago. Some of them suggested the Model T should be painted in different colors. After consulting his nearest advisers, Mr Ford stated that he could see no need for making the manufacture of the cars more complicated by painting them in different colors. He said that they could not be made fast enough.

Al should know, as most people know now, that this conclusion was a mistake. Why repeat mistakes, Al? Ed's and Al's crews are just as sensitive to colors as are the citizens at large—they are not color-blind.

Both machines, walls and ceilings should be color-conditioned. It helps speed up production and makes everybody more satisfied. The question whether or not aluminum or stainless might be used against ivory and light blue, as well as gray, should be turned over to a firm specializing on colors in machine shops.

Even if nothing can be done about the machined surfaces, there is a lot of surface in each man's area that can be made cleaner and brighter, and consequently more cheerful by using a little paint. Yes, a little bright color does relieve the monotony and pep things up. It also helps handling, and cuts eye strain and fatigue.

The question about stomach ache and virus is, of course, a joke, but shows that Al has been cornered.



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As limits, safeties and interlocks, they make existing equipment safer, more efficient and more productive. They are available for bottom and side mounting and with actuators to take any kind of actuating motion.

Ask for them at your local authorized MICRO distributor. You will find him under "switches, electric" in your classified telephone book. MICRO field engineers are located in principal cities, too, to assist in the solution of complex switch problems. Call your nearest MICRO branch office.

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MACHINE TOOLS • CUTTING TOOLS • GAGES

Color painting encourages production and raises morale. Although it might not be as important as orderly arrangement and proper lighting in raising efficiency and safety, it does help to some extent.

A E Fristedt
Stockholm-Bromma, Sweden

•

PRIVACY, PLEASE

Does working in partitioned enclosures tend to increase efficiency? Will the men resent being stalled off and separated from their fellow-workers? How does semi-privacy affect concentration—favorably or unfavorably?

YES, WHAT'S THE idea of all those little stalls along the bench? I think they should be removed as soon as possible because they don't increase efficiency at all, and it doesn't give the man the idea that he is working in his own sanctum. On the contrary, efficiency will suffer and supervision will be more difficult. To give any man a chance to do his best he must have plently of room, not only for his hands, but also for the tools he is using. I can't see how these simple rules can be satisfied with walls all around his elbows.

Most of the boys probably would not abuse the partitions to do monkey business, but a few of them might take the advantage of storing a lot of things that would hinder efficient work—perhaps some liquor would be included.

The reaction among the men would certainly be very unfavorable because they would feel they were being tied up in too small a space. They would also resent being separated.

I never heard of anybody objecting to a private office, but I have never seen an office as small as those partitions either. So the comparison is not fair at all. If an executive was offered a partition of that kind now as his office, I don't think he would accept it, although many years ago it was quite common in the small shops.

And it wouldn't be very lucky to change working place when two men are working together; it would cost more to move around like that.

I agree with Ed. Even a TV set might be found hidden away in any of the stalls. I believe in keeping everything out in the open. The whole idea is no good; therefore, Al, tear the walls down—the sooner the better.

Yes, there is a limit to company fixin's around the shop. A good idea

is to let the men participate in the planning of any shop, then there will be less gripes and no stalls will be necessary.

A E Fristedt
Stockholm-Bromma, Sweden

•

ALTHOUGH IT IS DIFFICULT to put a finger on it, Al's attempt to make the men feel important looks kind of strange. Even if Ed says that he has never heard of anyone refusing a private office, it depends on the private office. Some people suffer from claustrophobia, and others do not like to have the walls of the office hit their elbows every time they turn around.

And what privacy do the men require? If they are due for an interview with the foreman, this worthy has his own office for the purpose. They have no "secret" or otherwise "classified" documents floating loose on the bench, and any documents which may be found tacked to the walls may not be particularly appreciated by the management.

But there is a way to improve considerably the looks of the shop without giving it a bad case of blinders. Do away with the old long benches and give each man his own bench.

There are several of these benches on the market at reasonable prices which can be obtained with back and end boards, foot rests, drawers, etc. In one particular installation, in a relatively old building, the old benches along the wall were removed; 5-ft individual benches for jig, fixture and die makers and 6-ft ones for machine construction were installed at right angles to the wall, approximately 3 ft apart. Each

"Frankin doesn't know it, but he's gonna get his next pay check in Holland."

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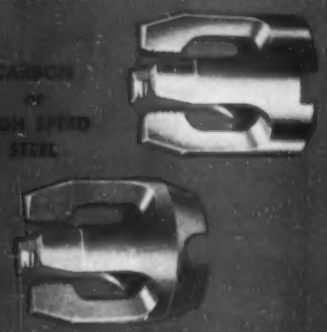

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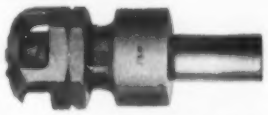

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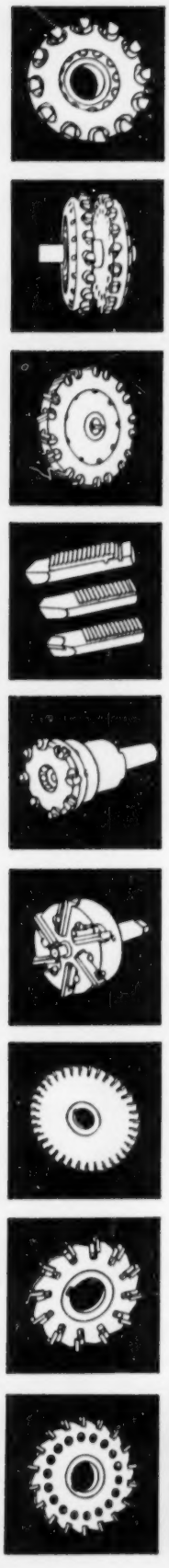

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bench was equipped with electric outlets for 110 and 220v to accommodate portable lamp and small hand tools, vise, of course, two drawers so that each man using the bench on the two shifts had his own, and a substantial steel plate, Blanchard ground on both sides.

While making these changes, small portable tables, bench high, were equipped with bench drills, jeweler's lathes, bench surface grinders, complete with self-contained exhaust systems. These tables could be moved to any bench and plugged in, thus relieving the larger tools of a lot of small work within the capacity of the portable machines, and also relieving (?) the tool makers of a lot of promenading around in search of available machines.

Of course, some jobs will be too big for the standard benches, but they can be handled on a few oversize benches.

Al will then do everything he tries to do at one stroke. Each man has his own bailiwick, which he has no excuse for not keeping clean; the underside of the bench is in plain view and cannot become a catch-all. Al will be surprised at the amount of scrap he can turn in, both tools and materials. Even if the men are separated, they are able to exchange information, and are in no danger of feeling like old hack horses.

And best of all, the toolmakers in this particular shop actually liked the new setup and would not return willingly to the old one.

P P Fenaux
Lynn, Mass

•

DOUBLE STANDARD

Will one set of prints, with fixed tolerances, solve the problem of variations in tolerances between engineering, shop, and inspection? Or will allowances continue to be made despite a single standard?

FROM HALF A LIFETIME of experience as a mechanical draftsman and mechanical engineer, the case of "Double Standard" strikes a very responsive chord. In my opinion, there is only one answer to the problem of who should set tolerances, and that is the engineering department.

In defining the degree of accuracy by placing limits and tolerances on required dimensions, the proper individuals to state what degree of accuracy, and how much finish is required, are the chief draftsman, and the designer in the engineering department.

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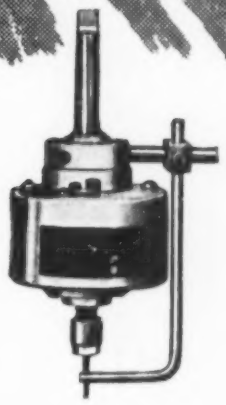

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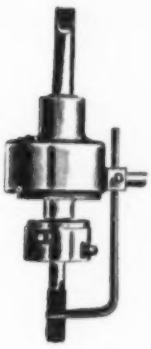

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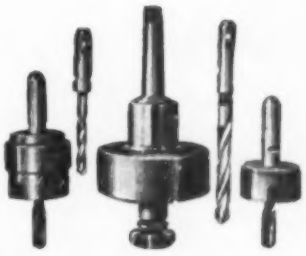

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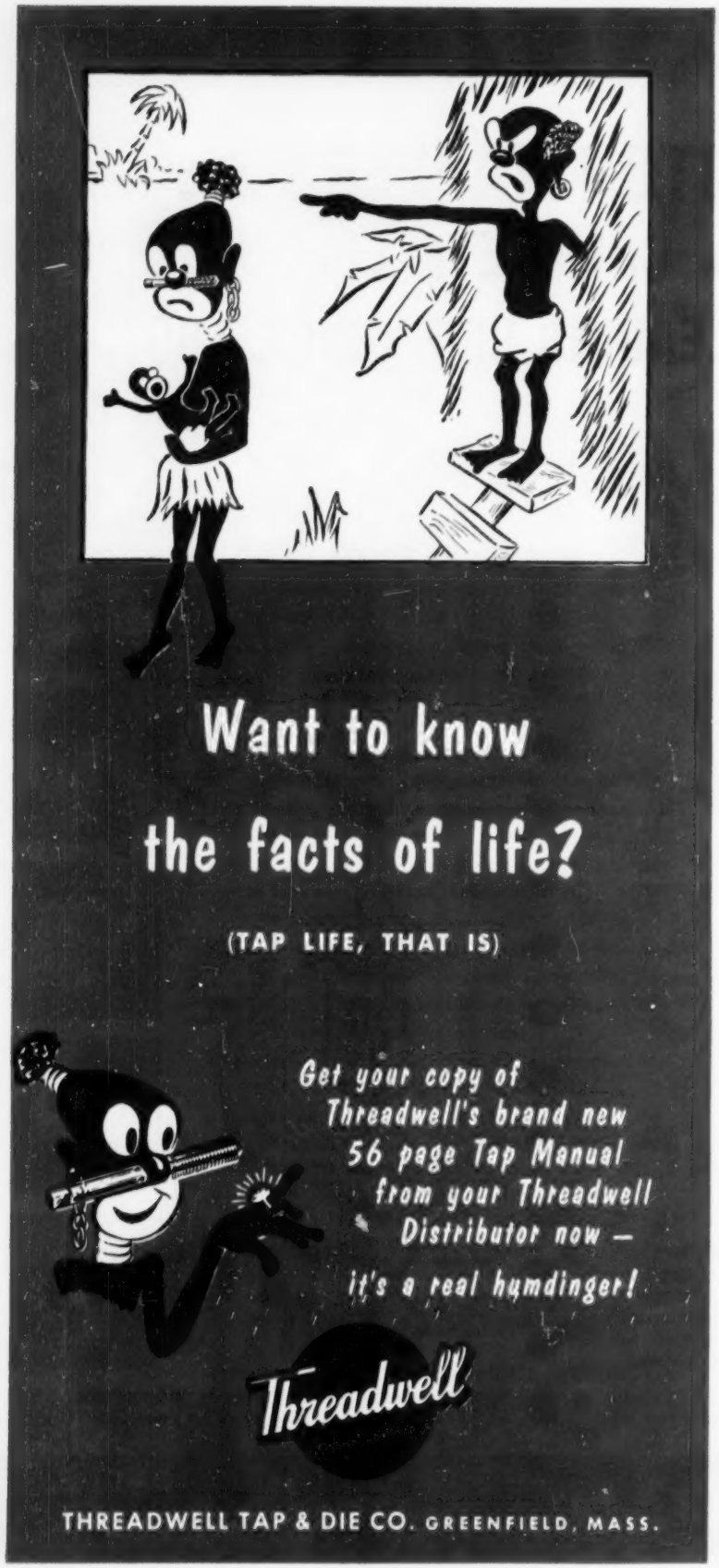

an individual print and has not seen an assembly drawing, and does not know in what connection the part he is making is used, he has no idea as to the requirements of accuracy and tolerances unless these are plainly stated on the drawing. When tolerances are not specified or followed, the result is that he may put too much time on the piece and give it the best finish possible. This is a clear loss of money, especially in cases of parts that have no particular need for accuracy, and where the finish will not matter because they are not visible.

It is therefore just as necessary and important to have this information determined by the designer and made part of the drawing, as it is to have the basic dimensions on the plan. Authoritative tolerances set by engineering must be followed by shop and inspection if the manufactured product is to meet specifications.

It would seem the better part of judgment to have one set of prints, with fixed tolerances, so that everyone concerned will know where they stand in the manufacture and inspection of the item. Double standards will only lead to trouble. The realistic solution is to have only final dimensions on the plan with both shop and inspection responsible for meeting them, and with the shop responsible for making its own allowances for roughing, lapping, and plating, and inspection responsible for allowances due to inherent limitations of measuring equipment. In any event, the limit on the drawing should be taken to mean what it says; thinking in terms of "double limits" is out.

One suggested practice concerning limits would be to set up a "Tolerance Committee." This committee would be composed of representatives from the shop, engineering department, and inspection. Initially, the engineering department

"I have been asked to relay a message,— you're fired."

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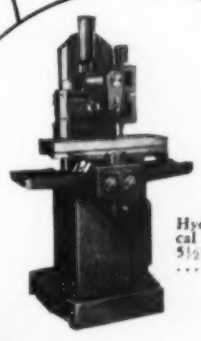

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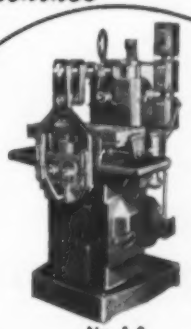

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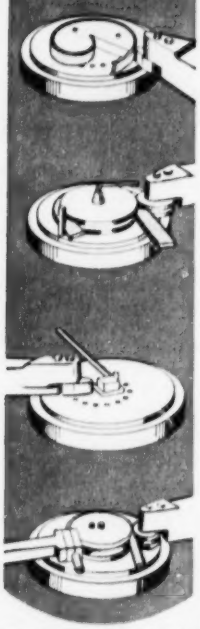

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would be responsible for the setting of tolerances, but before the plans are issued to the shops, the committee would have an opportunity to study them and establish the policy governing the setting up of the final tolerances.

The use of the double standard when applied to tolerances on drawing dimensions is a dangerous precedent. The practice of setting tighter tolerances than necessary as a so-called psychological move is not worth its added cost. An experienced designer knows from basic knowledge and past experience what the correct allowances should be. Drafting and design come first; they provide the base for the structure which is to be built, and are deserving of scrupulous adherence by the shop and inspection to the limits specified on the plans.

Yet the design department is often quite neglected in this respect by the shops and inspection, being considered a necessary evil which must be tolerated, and often abused. The designer makes use of systematic experience; taking into consideration past results, not only of his own, but those of others. He is cognizant of the value of eliminating unnecessary work in the shops through application of standardized practices of setting tolerances.

In the designer we have material of a high order, capable of great personal effectiveness; his work is largely creative, and the quality of thought put into it should set the standard all through the plant. However, the entire plant, including engineering, can well benefit from advantages secured through the use of an advisory committee such as the Tolerance Committee.

The idea of an advisory committee on tolerances can also be extended to other design matters, especially on new designs. In some plants the

"Good! we caught another rat last night!"

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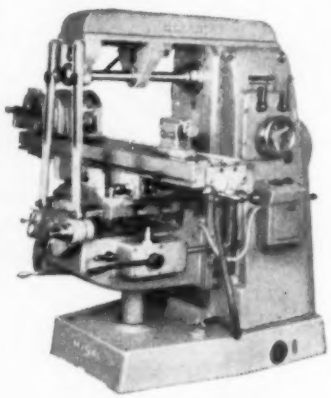

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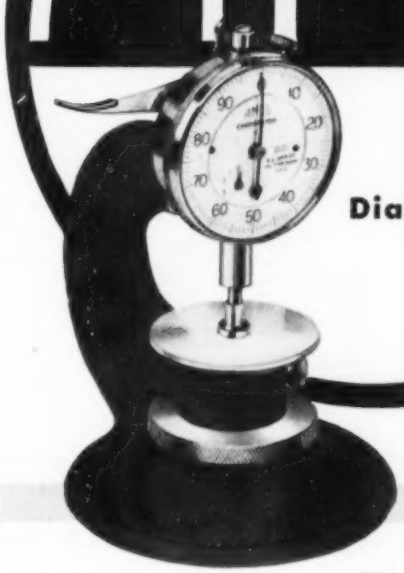
functions of a "Design Committee" aid in establishing major policies relative to the best design from construction, operation, and cost angles. One point to the disadvantage of a large plant in comparison with the small one is the closeness of touch which usually exists in the latter. A new design in the small factory would probably combine the best that the designer, foremen, and often the workmen could give it. There is a sense of exclusiveness in many large plants which is like the lack of neighborliness in a large city, and too many times a new design is first seen or heard of in the shop when the drawings are sent down for use.

To secure the advantages of an all-round point of view, and to forestall difficulties in advance, as for example in the matter of setting proper tolerances, should be the function of the design committee. This committee would consist of the designer, chief draftsman, sales manager, superintendent, foremen of the machining and assembling departments, inspection, and any others who are thought to have ideas of value on the subject. A preliminary design is usually presented for their consideration so as to provide a basis for comment, and the details are gone into one at a time from the various phases of operation, construction, cost and the like. The result of this is that, when the design in detail is made and sent into the shop, it is as nearly right as the combined intelligence of the different men can make it, and a great deal nearer to being correct than if it were the product of one mind alone. This also has the advantage, less measurable in dollars and cents, of forestalling the criticism of the chronic kicker who can always suggest a better way to make things. In this case he has the opportunity of relieving his mind on the subject before it is in final form, and if his suggestions are of value, they are incorporated.

Another subject which may well be considered by a committee of this sort is that of design changes for the purpose of cost reduction. It offers an opportunity to examine and review tolerances on drawings from a critical standpoint with a view toward liberalizing them to conform to experiences in the shops. Unnecessarily tight tolerances are expensive. After all, the purpose of tolerances on drawings is to make certain that manufactured parts will actually be within the size specified. They should not include allowances for variations in measurements.

AMES



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This is smallest in the Ames' line of high quality dial comparators and it is ideal for desk or bench use in the fine inspection of small precision parts. It is light in weight, but its broad base makes it very stable. The capacity approximates that of the regularly supplied Ames No. 202 Dial Indicator which has a dial numbered 0-100, graduated in .001" and with a .250" range. Should your job requirements differ, you can have the No. 2 with any Ames "Hundred Series" Dial Indicator. Send for Ames Catalog No. 58 covering the entire line of Ames Top Quality measuring instruments or, better still, send complete details of your Quality Control problem. Ames will suggest a solution – no obligation, of course.

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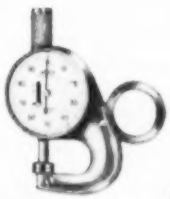

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Single set-up covering
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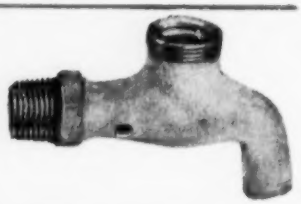
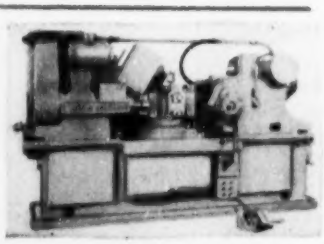
MEANS GREATER ACCURACY *with* **GOSS DeLEEUW**





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One of the many important advantages being realized with this new chucker is the performing of ALL finishing operations on a single chucking of the work. In addition to the time saved, this feature, exclusive with Goss & DeLeeuw "1-2-3" machines, means only one handling of the work with an attendant greater accuracy. This machine is in a class by itself in precision finishing.

In Goss & DeLeeuw "1-2-3" Automatic Chucking Machines, one, two, or three ends of the work are machined simultaneously or in sequence. There is no need for resetting, retooling or secondary operations. More work from one machine and greater accuracy are matters of record.

Ask for illustrated literature describing the operation of this chucker in detail. Send samples of your work for time and cost estimates.

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QUALITY CONTROLLED
PRODUCT-QUALITED

This committee will eliminate the danger of double standards — different sets of tolerances in the engineering department, the shop, and in inspection. The shop through its intimate experience in handling a piece of work often sees opportunities to do it to better advantage if some changes were made in its form, or if specified tolerances were liberalized. When this is suggested to the designer, the combination of pride and obstinacy quite often causes feasible changes to be neglected. The shop foreman may grumble and probably will, but not being a squealer, the matter is allowed to drop and the interests of the firm suffer in consequence. If matters of this kind are taken up in committee meetings at which an unbiased official, as the general manager should be, is present, desirable changes will undoubtedly be made. And the shoe is not always on the one foot, for the designer may often suggest a better method of machining than the one which is in common use in the shop.

Where double standards are permitted to exist, there is danger that shop practice and recorded design will draw gradually apart, leaving an opening for much confusion and error. Of prime importance, to avoid this, is the necessity of laying down a hard and fast rule that no changes in design, and especially in specified tolerances on plans, are to be made unless authorized by the drawing room. However, it must be kept in mind that too much opposition to a change for the better will have the effect of killing all tendency toward improvement suggestions, and since many of these come from the shop after the theory of the drawing is reduced to definite

"Unh unh—I don't show you my design 'til yuh gimme a raise."

The Story of

"The Crow and the Pitcher"

MAKES A POINT FOR GRINDING FLUID USERS...

The Story (one of Aesop's Fables)

A long, long time ago, a terribly thirsty crow had searched miles for water before he found an old pitcher with water in it. But the water was so low he couldn't reach it. His *obvious thought* was to push the pitcher over, but just in time he realized he'd lose the water that way. So he searched until he found some pebbles and, one by one, dropped them in the pitcher until the water level rose to where he could reach it.

The Point

The *obvious thought* about grinding fluids is not always the best. When selecting a grinding fluid for a precision grinding job, some plants think first of "just a coolant"—yet, many times, "more than a coolant is needed". A case to prove the point is shown at right. A low cost soluble oil was obviously not the answer to this straight grinding oil job! True, the initial cost of the grinding oil is more than that of the water-mixture, but the benefits offset the initial cost many times over.

If you grind valves, pistons, tappets, jet engine buckets or other aircraft parts, cutting tools, gears, or other parts where higher surface finish, less heat checks, or longer wheel life are desirable, just a little extra thought before you "tip the pitcher over" may pay great dividends. Investigate Stuart's Precision Grinding Oils. Fill in and mail the coupon below.

Comparison
Soluble Oil vs. Grinding Oil
on Valve Grinding Operation

	OLD METHOD		NEW METHOD	
Grinding Fluid	Soluble Oil		SuperKool #1X Grinding Oil	
Material and Hardness	Steel Forgings Rc 30-36		Steel Forgings Rc 30-36	
Stock Removal	VALVE STEM Finish Grind .004"-.006" in 2 passes	VALVE FACE Rough Gr. .006"-.008" Finish Gr. .004"-.006" in 2 passes	VALVE STEM Finish Grind .004"-.006" in 1 pass	VALVE FACE Rough & Finish Grind in 1 pass .014"
Average Production per Wheel Dressing	350-400 pcs.	300-350 pcs.	2000 pcs.	1200 pcs.
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Coniflex* type bevel gear, used in lift truck

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practice, a condition of this kind must not be allowed to occur.

A definite procedure for handling changes is therefore desirable. This could be accomplished by providing those who are in a position to request changes in design, tolerances, or finishes with padded books for that purpose, retaining a copy of the suggestion. These suggestions are then considered by the design or tolerance committee. In this way the matter is pretty sure to be threaded out thoroughly and changes which are not important will probably be passed over, since they tend to disturb standardization. A system of this kind maintains automatically what has been termed the progressive standard, since changes of small importance are not likely to be made under it, and those which are made will advance the standard.

When specified tolerances on plans are not adhered to in the shops, the practice is the same as permitting mistakes on drawings to go unreported to the design department. A mistake in a drawing may be discovered, and becomes a point of knowledge to the foreman and some mechanics, to be corrected by them when occasion requires with the next occurrence of the same work. The drawing is not corrected, but all goes well until the work is given to a new man, in which case it is quite likely to be spoiled. To obviate the chance of this, definite means must be provided whereby tracings, and prints as well, are immediately changed as soon as an error is discovered. This practice should also cover any deviation by the shop in following specified engineering-set tolerances. If this is not done, after a period of time the drawings and the actual work becomes further and further separated, and the burden of special information becomes so great that it is impossible to avoid costly errors.

Where specified tolerances are

"Knudsen has said this is a cheap outfit to work for ever since he started, 38 years ago."

adhered to, then engineering, shop, and inspection will all be talking the same language, and it will be possible in case of assembly trouble to fix responsibility and eliminate future errors by being able to determine if the fault was that of the operator, the machine, or the tolerances to begin with.

A single standard for tolerances and finishes makes it possible to control production of manufactured articles with the necessary accuracy. A single standard is the establishing, by authority, of a model to be followed. Double standards for tolerances negate the benefit of scientifically set allowances because they introduce the elements of looseness and chance.

Harry Kaufman
Philadelphia, Pa

•

THE ENGINEERING DEPARTMENT sets up the specifications and tolerances for each job—that is the tolerance the job should be held to. There should be no deviation from the specifications as set up unless it is OK with the works manager and engineering department.

Closer standards are usually set than are needed to actually pass inspection. This is as it should be, for several reasons. It is a safeguard against human failure, carelessness, and following operations which may change the size or be affected by the change.

In any case, where the standard cannot be met or where it would benefit the operation to make a change, the foreman should notify the works manager who in turn takes it up with the engineering department. When the specifications are changed, approval of the works manager and all other departments affected by the change should be obtained.

When department heads ignore the tolerances to suit themselves, general confusion results. The heads of all departments must pull together for a smooth working organization.

A E Salmons
Philadelphia, Pa

•

TOLERANCES PLACED after a dimension means: "If you can't make it the size specified, a little more or less will be accepted." The engineering department realizes that because of machine and tool wear, a part cannot be made in quantity to an exact dimension and, therefore, makes an allowance for those pieces that fall

27%
SAVINGS ACHIEVED WITH THIS STANDARD WENDT-SONIS TOOL

THE PROBLEM

A high speed steel drill 17/32" in diameter was being used to drill a cast iron hydraulic valve lift body, chilled on one end. This drill could be used approximately three hours before requiring resharpening. Such short tool life in itself resulted in high tool cost per finished unit.

THE SOLUTION

Art Grover of Grand Rapids Supply Co., Grand Rapids, Mich., supplied the solution. Art recommended a standard Wendt-Sonis carbide tipped drill, with a slight modification of the drill point which was done in the Company's own tool room. This drill was used for nearly twelve hours before dulling and produced approximately 18 more pieces per hour with overall saving of 27 per cent on the completed unit.

WENDT-SONIS WILL SAVE YOU MONEY

This is just one more example of the savings that can be made with Wendt-Sonis Standard carbide tools. It is interesting to note that about 84 per cent of all carbide requirements are covered by standard Wendt-Sonis tools available from your local Wendt-Sonis distributor's stock. He will be glad to help you select the right precision cutting tools that will cut production time and reduce tool costs.

NEW! 1953 ILLUSTRATED W-S CATALOG

Write today for the new Wendt-Sonis illustrated catalog, number 53. Contains complete details and specifications for the W-S line of standard carbide tools. You'll find this a helpful source for selection of the proper tool for every tool application.

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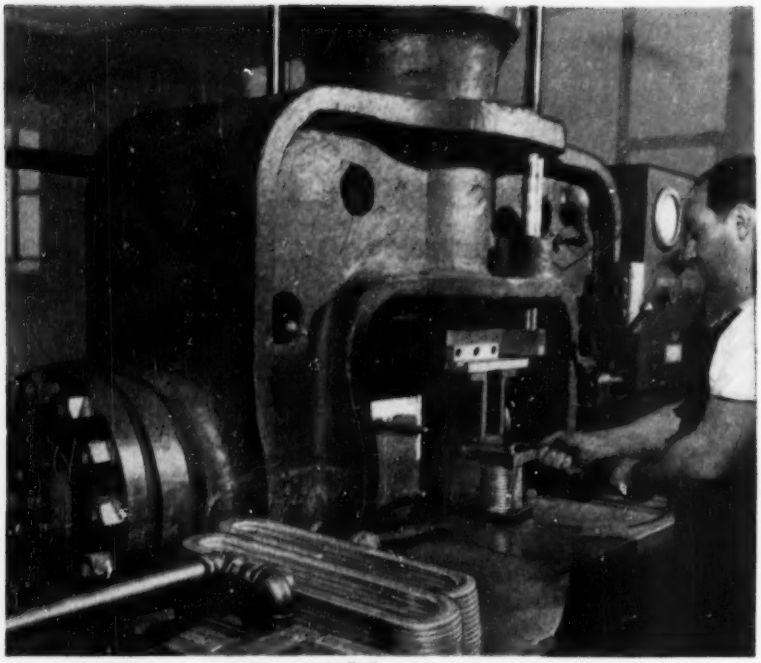

How this 2-way

FARQUHAR Hydraulic Press

forms motor and generator coils

In producing motor and generator coils from ¼ x 1-in. copper stock, the stock is first bent and the ends laminated, and then pressed to restore them to their original thickness. Then, the coil is put in this Farquhar 2-way Hydraulic Press for "pressing" the form.

The coil is laid on a steel block, a three-part filler mandrel inserted, and a top block applied. The press "snugs" the coil sides at low pressure (40 tons); then the vertical ram snugs the top. The operator kicks the pressure-shift pedal, to double vertical-ram pressure for forming.

Capacities of rams are 100 tons horizontally and 200 tons vertically. Illustration above shows operator withdrawing the coil after forming has been completed.

Farquhar Presses Cut Your Costs

The above installation is just one more example of Farquhar performance in heavy production! Farquhar Presses are built-for-the-job . . . assure faster production due to rapid advance and return of the ram . . . greater accuracy because of the extra guides on the moving platen . . . easy, smooth operation with finger-tip controls . . . longer life due to positive control of speed and pressure on the die . . . long, dependable service with minimum maintenance cost!

Farquhar engineers are ready to help solve whatever production problem you may have. Their expert assistance is yours for the asking. Give them a call . . . at no obligation, of course!

Or, send for our free catalog showing Farquhar Hydraulic Presses in all sizes and capacities for all types of industry. Write to: THE OLIVER CORPORATION, A. B. Farquhar Division, *Hydraulic Press Dept.*, 1506 Duke St., York, Pa.

Farquhar
HYDRAULIC PRESSES
for Bending • Forming • Sizing • Straightening • Assembling • Drawing
Extruding • Loading • Forging • and other Metal-working Operations
THE OLIVER CORPORATION • A. B. FARQUHAR DIVISION

within a reasonable range. The amount of the range depends upon the function of the part with the assembly.

When a machine, engine, or device is assembled, its efficiency depends upon the fitting of component parts. If these parts are made in various departments of the plant or subcontracted through other shops, some control must be established to maintain fine quality. The engineering department determines how much the piece can vary in dimension and still be effective.

The final inspection department uses the extreme tolerances permitted. They know that any part not within the tolerance will not fit or function properly during assembly.

The production department will take full advantage of any tolerance specified and fight for more to maintain their schedule. They will also try to push through pieces that are a hair under or over. For this reason, they do not get the full tolerance and are held to closer limits. It is also good policy to keep the shop to the nearest limits possible. The men get so used to working to close limits that they become more efficient.

During World War I, the shops griped about holding dimensions to 0.010 in. The engineers were determined, and forced them to stick to the print. As the years went by, with improved methods and equipment, the tolerances were shaved, making possible more efficient auto and plane engines, better radio and television reception, new products, but the gripes continue.

Today, many shops are working

"Maintenance ordered a dozen hard wood truck wheels with bronze bushings."

SERVICE PIN... for you, too

Chances are you've seen this pin. It represents 15 years of service with Socony-Vacuum. Six out of 10 of our industrial engineers and salesmen wear it. Four out of 10 have served over 20 years. In fact, the average length of service of *all* Socony-Vacuum lubrication and process products representatives is almost 17 years! All this petroleum engineering experience, the world's greatest, is yours when you call on Socony-Vacuum. Why accept less for *your* plant?

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SALVAGE 95%
...of unproductive tool-change time

"Get Greater Precision, End Chewed-up Shanks"

"Eliminate Keys, Collets and Wrenches"

TO OPEN—Grip sleeve, pull down; jaws open automatically and tool is released.

TO CLOSE—Insert new tool, grip tapered part firmly; tool is locked in place.

Equip your drill presses, boring mills, jig borers, milling machines, lathes with

AMF WAHLSTROM *fully automatic instant change* CHUCKS

SAVE TIME—Changing tools in an AMF Wahlstrom Chuck takes only 2 or 3 *seconds—not minutes!* No waiting for the spindle to stop! No hunting for keys, collets or wrenches! Four hardened and ground jaws automatically center the tool and provide a grip that can't slip, can't chew up shanks. The greater the load, the tighter the grip!

SAVE MONEY—With AMF Wahlstrom Fully-Automatic Chucks on your machines, as much as 95% of the time usually wasted in changing tools can be converted into *productive* time—time that adds up to many hours per month . . . per operator.

SAVE CAPITAL INVESTMENT—A single spindle equipped with an AMF Wahlstrom Chuck does the work of *several* spindles . . . makes it practical to drill, ream and counterbore many different size holes successively, *without moving the work.* Model "A" (shown) available in two capacity ranges: 1/64" to 3/8" and 1/32" to 1/2". Other models for larger tools.

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on jet engine parts, with tolerances in the same class as tools and gages. In the near future, the 6-inch scale will be obsolete and every machinist will carry a 6-in. vernier. Every bench will have a microscope micrometer or a light wave recorder. Any job calling for plus or minus a hammer handle will also specify the size of the hammer.

Frank J Zarnowski
Rutherford, NJ

•

A QUALITY PRODUCT manufactured and marketed at a fair profit is the only formula by which an industry can survive or expect to grow. And what constitutes a quality product? It is a product that a manufacturer has faith in, faith enough that he is willing to place a guarantee on it. It is a product that will perform equally as well as quality competitive product.

Quality must first be engineered into a product. Practical standards must then be established, and whether these standards are related to finish or dimensional control, they should be maintained.

The establishment of practical tolerances is a joint responsibility involving all the functions of management. They can be detetmined only by a thorough testing program. Once the engineering department sets a rigid tolerance, it should be able to prove to the manufacturing department that a deviation from the established tolerance will result in failure or cause unsatisfactory performance. One set of standards, plus the wisdom of a philosopher, is all that should be necessary in the control of quality.

Double standards, or deviations, are the offsprings of improperly established methods, worn-out tools and equipment, or obsolete equipment. The sacrificing of quality is dangerous practice, and once it has been established that a specific tolerance must be maintained, the answer can be found in the vast resources of our technical abilities and industrial economy.

Peter L Budwitz
New Britain, Conn

•

THE MERRY-GO-ROUND which never stops is similar to the problem whicn seems to confront Ed and Al this time. Perhaps the old question of which came first—the hen or the egg—is not unlike the double-standard question. For in the case of engineering tolerances it is hard to say why engineers do persist in estab-

lishing close tolerances, for they often know it is not required. Yet when we begin to analyze the problem we see several trends which perhaps form a pattern of thinking.

From the engineer's standpoint—first, he is interested strictly in pure theory. This means that nothing will properly operate unless everything is closely developed and all tolerances are held to a minimum. Engineers are not practical men when they start out in life. They seldom can understand shop practice and believe that the workers in the shop are crude butchers of metal. Strangely enough many of the close tolerances established by the engineers in design work do not properly add up and many, many times the shop has to call on the engineers to straighten out the condition. This naturally causes ill feeling on both sides. It hurts the prestige of the engineer, and the worker dislikes the fact that often his work on the job has been for naught.

Drawing tolerances never should be used if there is no reason to set up a set of tolerances to make the part or tool work. Close tolerances will make tools more expensive and while the feeling is that to give a shop an inch, they will take a mile, it is, after all, the shop which must finally do the work on the tool. If reasonable tolerances are specified and the shop does not live up to the standard, then they are completely to blame. However, if close tolerances have been set, and the cost of production is high, the engineer must actually take all the blame should the tool not properly function due to tolerances.

Never should a company set up a double set of tolerances—one for the shop and one for the engineers. This would certainly be asking doubly for trouble. Neither can the shop set up the tolerances, since in

Puzzle — who cut the part 0.006 undersize?

TOWMOTORS IN ACTION IN U. S. INDUSTRY

Loading a 1,200-pound cargo of castings into an American Airlines freighter.

Right on schedule . . .

However tight the timing and whatever the type of load . . . Towmotor measures up to stiffest materials handling requirements, while bringing man-hour costs 'way down in the bargain. Write for your copy of "Man-Hour Thieves," Towmotor's new handbook for lowering plant operating costs, and name of your nearest Towmotor Representative. Towmotor Corporation, Div. 5603, 1226 E. 152nd St., Cleveland 10, Ohio.

Make the Towmotor Exhibit your first stop at the 5th National Materials Handling Exposition starting May 18, 1953

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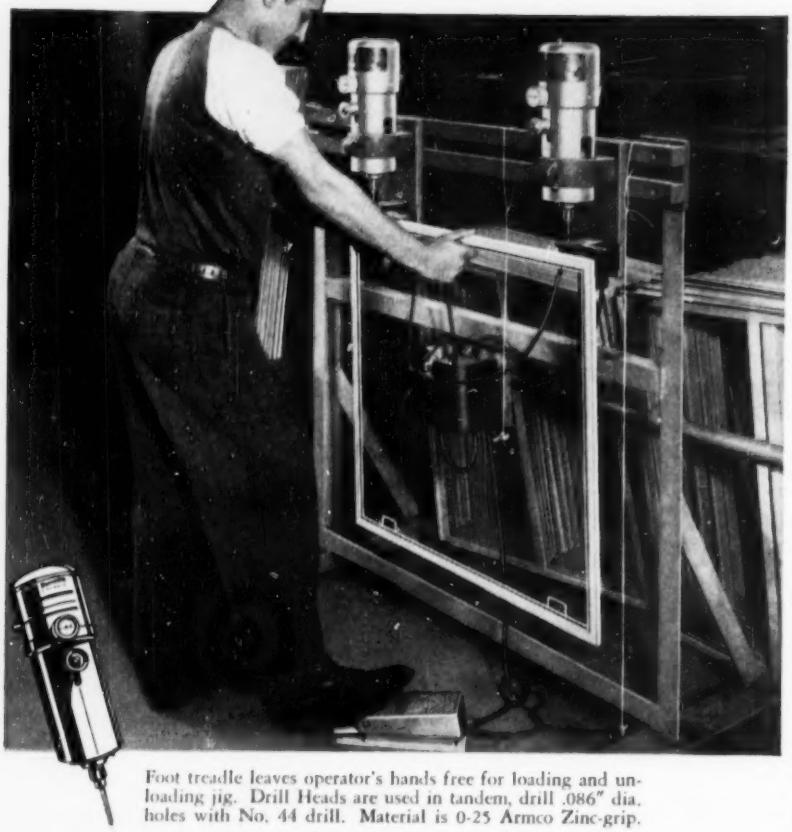
SINCE 1919
RECEIVING • PROCESSING • STORAGE • DISTRIBUTION

DUMORE DRILL HEADS

cut small hole drilling cost 75%

..multiply production 4 times!



Foot treadle leaves operator's hands free for loading and unloading jig. Drill Heads are used in tandem, drill .086" dia. holes with No. 44 drill. Material is 0-25 Armco Zinc-grip.

Metal window manufacturer drills 600,000 holes yearly with these amazing tools!

THE world's largest manufacturer of all-metal combination screen and storm sash installed 2 Dumore Automatic Drill Heads . . . got these almost incredible results. (1) 600,000 instead of 150,000 holes drilled per 2000-hr. shift-year. (2) Cost per 1000 holes decreased from $23.00 to $5.60. (3) Drill breakage reduced to the point where savings paid for the Drill Heads in 13 months.

And the most amazing thing about this report is that it is not an isolated case. In fact, increased output and similar savings on costs of production, scrap loss, and reductions in down-time, are being effected in practically every instance where Dumore Automatic Drill Heads have been installed. As this manufacturer says, "They are a 'natural' for multiple drilling operations."

To get an idea of how these amazing tools can help you improve your production and cut your costs, see your industrial distributor, or write:

THE DUMORE COMPANY

1337 Seventeenth Street • Racine, Wisconsin

the shop the overall design is not well determined. Usually only individual parts show up on separate drawings. It would be costly to have a shop man go over the design with as much effort as would be required to properly set up tolerances when time has been previously spent on the design.

We must depend upon our engineers, but we must properly educate our engineers in shop practice. More time must be spent in the shop by the graduate design engineer before he actually sets about to design tools, fixtures and the like. He must learn how things are made and learn the cost involved in working to close tolerances when they are not actually needed to make the tool function properly.

Education is the solution to many evils, and in this case both the engineers and the shopmen will learn much which will help to solve the problem and heal the wound which now exists between engineers and shop foremen.

Charles D Townsend
West Hartford, Conn

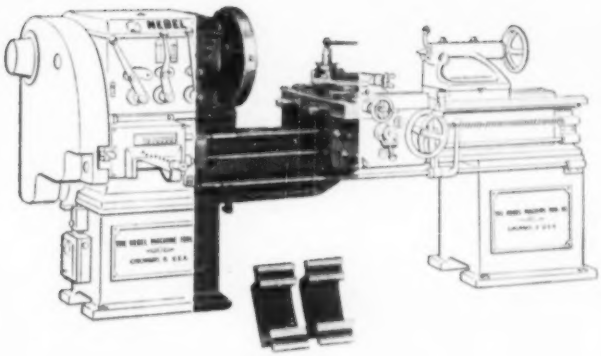
•

ANGLES — OR CURVES?

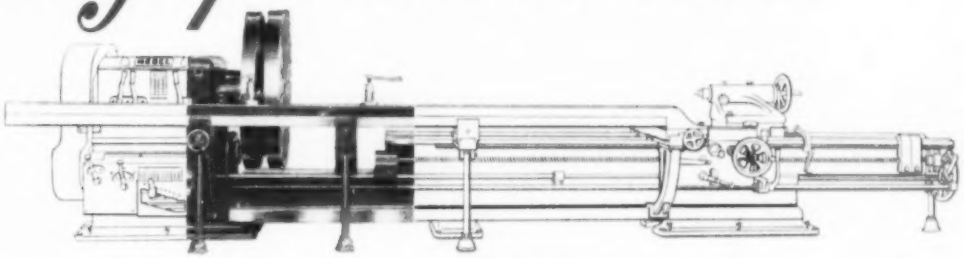
Is an employer justified in requiring a man to work overtime without ample warning? Can a worker justifiably refuse, if such emergencies are infrequent?

WHEN CONSIDERING WHETHER a company has the right to demand overtime from a worker it might be well to first analyze the existing conditions. First, if a company is small and all the workers are on a more or less "one of the family" type of existence, then usually the higher executives feel that the demand for extra time is justified. This feeling comes from the fact that the management and the workers are supposed to be more or less one. What benefits the overall company is supposed to benefit the individual worker or workers beyond the extra hourly pay that they will naturally get. Generally in such companies little or no trouble ever occurs if an individual worker is asked to remain overtime for an hour or so.

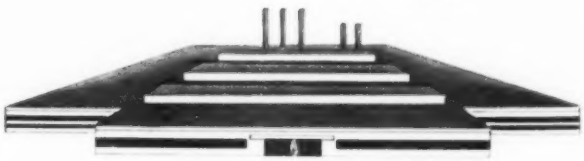
However, to make this operation function smoothly, there must be some effort made by the foreman to keep the suddenness to a minimum. People do not like to have to make snap decisions. It overtaxes their makeup and causes frustration. Such frustration can take many forms, from a feeling that the company is



the gaps in our line



fill a need in



your plant!

If you have a variety of big, bulky, odd-shaped pieces to turn regularly, you need a Nebel gap lathe. Either a removable block gap or an extension bed gap. Depends on your individual requirements. Your Nebel distributor, located conveniently close to you, will be glad to help you decide which is better. Why not phone him now?

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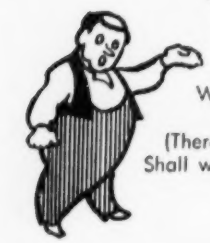
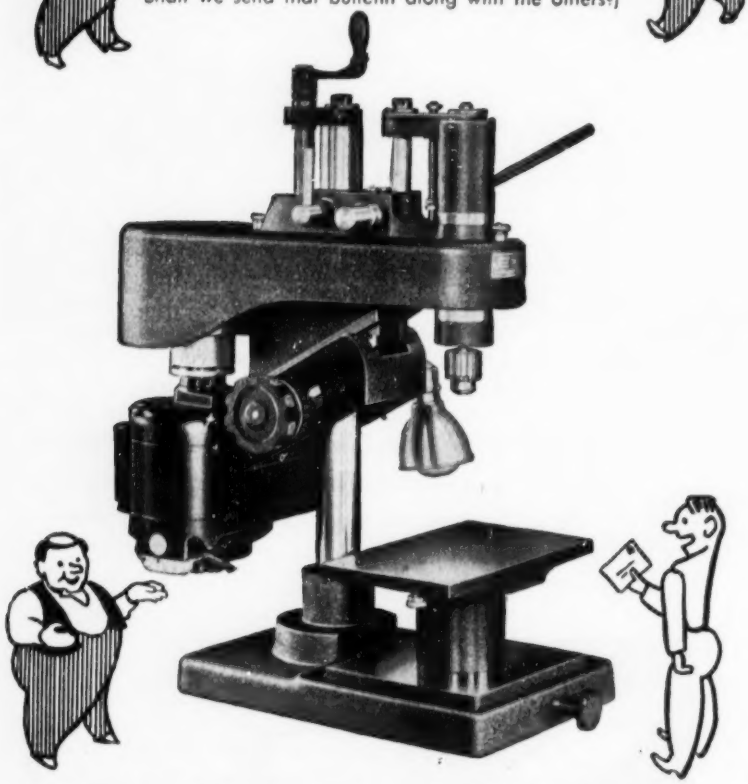
Hamilton Drilling Machines can do it!
And withdraw the drill undamaged
from hole after hole after hole!

LEARN HOW!

Write for the series of Hamilton Drilling
Machine Bulletins and Price Lists.
(There is also a companion Tapping Machine.
Shall we send that bulletin along with the others?)





Shown here is the Hamilton Varimatic, Super Sensitive, Variable Speed, Small Hole Drilling Machine, one of four models, each particularly adapted to the work for which intended, all equally precise.

THE Hamilton TOOL COMPANY
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not using them fairly, to a hatred of the foreman.

In the case that Ed presents, the man would not work. Perhaps this was caused by the manner in which he was asked, or because there was a continual emergency which was being used too frequently, at least in the mind of the worker.

A worker, even though he is an hourly paid employee, and will collect much for the hours he puts in, also is a person who likes his home life and enjoys freedom from his job. He likes to be considered as a person rather than just a gear tooth in the gear train of industry. Our foremen can help in seeing that these workers feel that they are a part of the company. Being a part of the company also means sharing in the good and bad which always exists. No one individual can have all the sweet without some sour, but in taking the sour one wants to know well in advance that he must suffer as well as the next.

In this world of ours we are rapidly expanding and new ideas take the place of old ideas. The idea that a worker's life is bought for the pay he receives on payday has gone. Industry has been forced to admit that this, together with many other practices, has caused our strong unionized system. Perhaps the pendulum has swung to the other extreme, but never in the history of industry has the individual worker obtained as much respect from management as he has in the last few years.

A company does have a right to plan to work overtime. A company

"Plans of that huge press we're building — just what it's capable of we don't know, other than the fact it's the biggest in the world!"

has a right to expect that in 99 cases out of 100 the individual worker will stay on the job during the emergency. However, let us not forget that to *ask* and to *demand* are two different conditions. The asking, when properly done, can generally solve many problems. Many problems facing industry today are caused by unskilled foremen who do not know how to ask but try to show their authority by demanding.

What about salary workers? Are these souls purchased for more than 40 hours each week? The general outlook seems to fall into two parts. One, those individuals who are paid a salary lower than the amount specified by government control and are, therefore, subject to time and a half over the base of 40 hours.

The other group of persons on salary are generally high enough in management to know the problems that exist and are willing to apply their time accordingly. They are paid for their knowledge and not for time alone. They generally shape the company plans and when it becomes necessary to spend extra hours on a project, it is done without fanfare.

However, a word of caution. It is always well to remember that to continually live in a state of emergency is due to only one thing—the inability to do your job properly. Either you are not capable of getting your job done in eight hours or you're burdened with too much detail. Better look the situation over—examine yourself and see how *you* stack up if *you* have put in extra hours to do your job.

In this discussion there is one lesson which can be stated quite simply. "Do unto others as you would have them do unto you." Don't demand extra hours—ask for volunteers whenever possible. Play the game squarely and the workers will play squarely with you.

Charles D Townsend
West Hartford, Conn

"Toin-n-n-n-n-n-n-n-n-ng!"

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OBSOLESCENCE IS MORE than a matter of age—it's often Man-made. The fork trucks you bought from us 10 years ago were the best money could buy—THEN. But today they're obsolete.

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Here's a complete line of modern trucks—gas, electric and diesel powered—that will outproduce your old equipment. You bought your original truck because you wanted to cut costs and increase efficiency. Now, competitive cost is more important than ever. And now is the time to replace the old equipment.

Your local CLARK dealer can give you the prescription for curing obsolescence—the specific reasons why *new* CLARK trucks are an investment in money-saving. Yes, you can blame us for obsolescence. But when you see what our new equipment will do for you, we're pretty sure you'll thank us for it.

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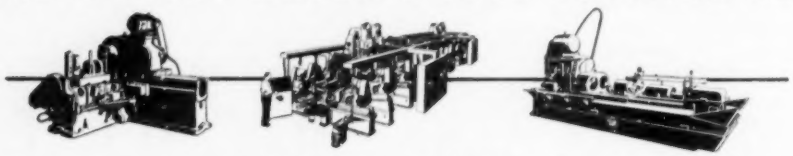

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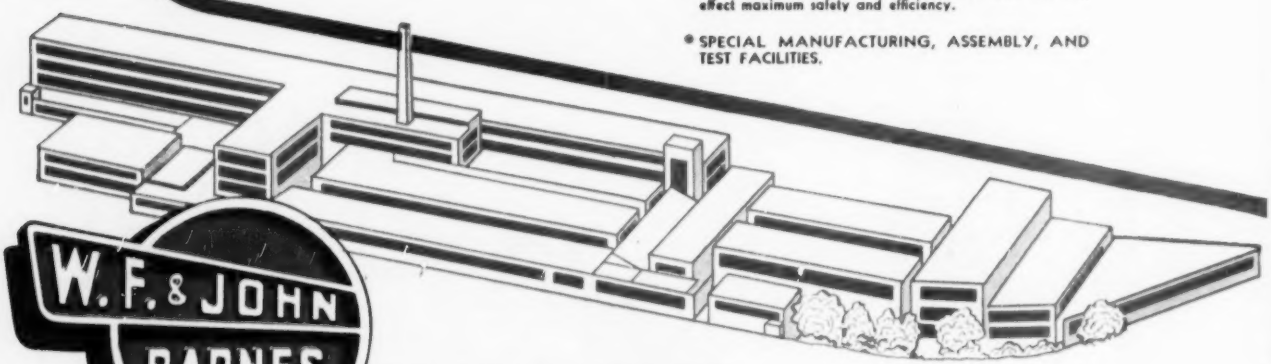

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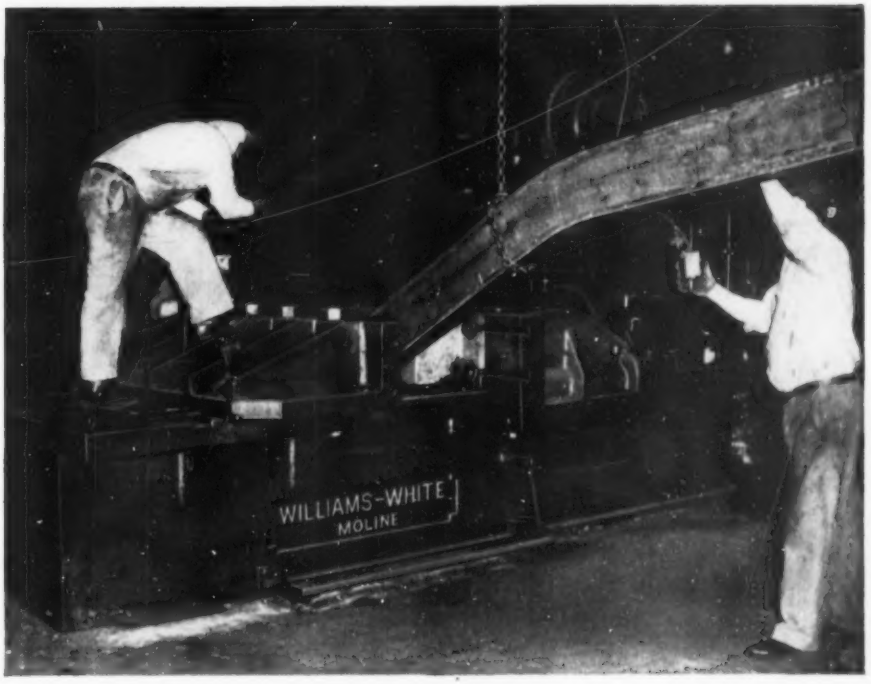

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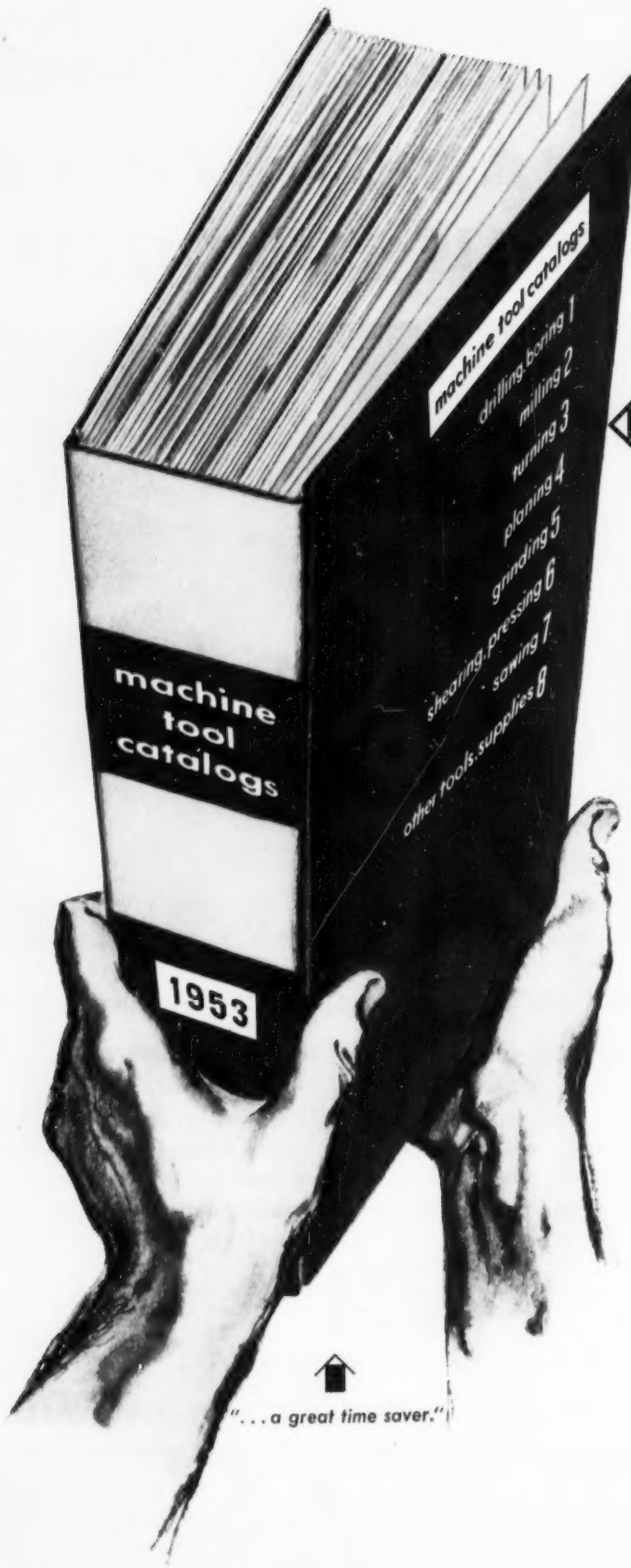

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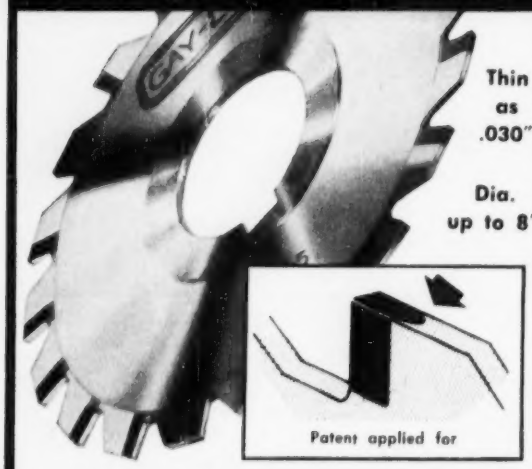

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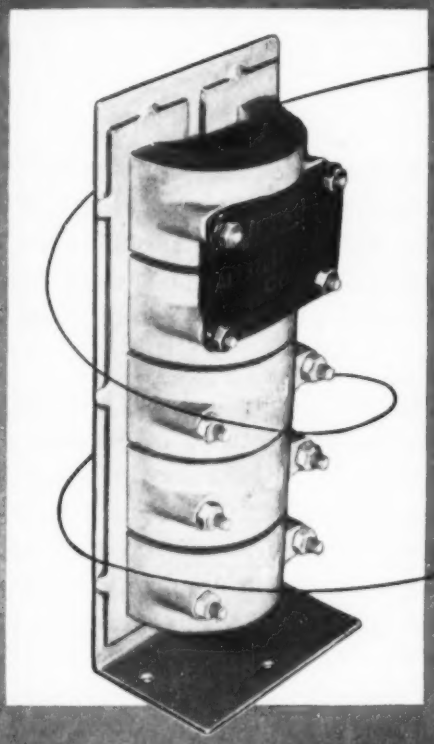

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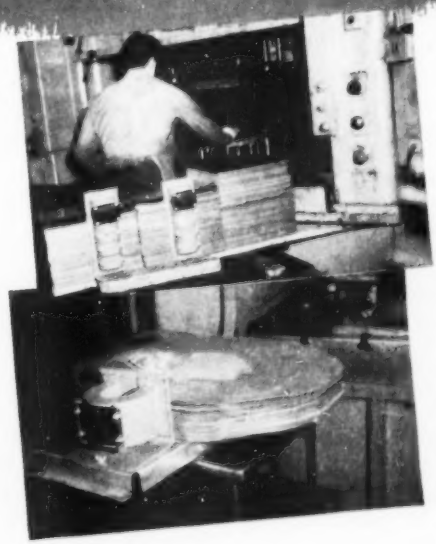

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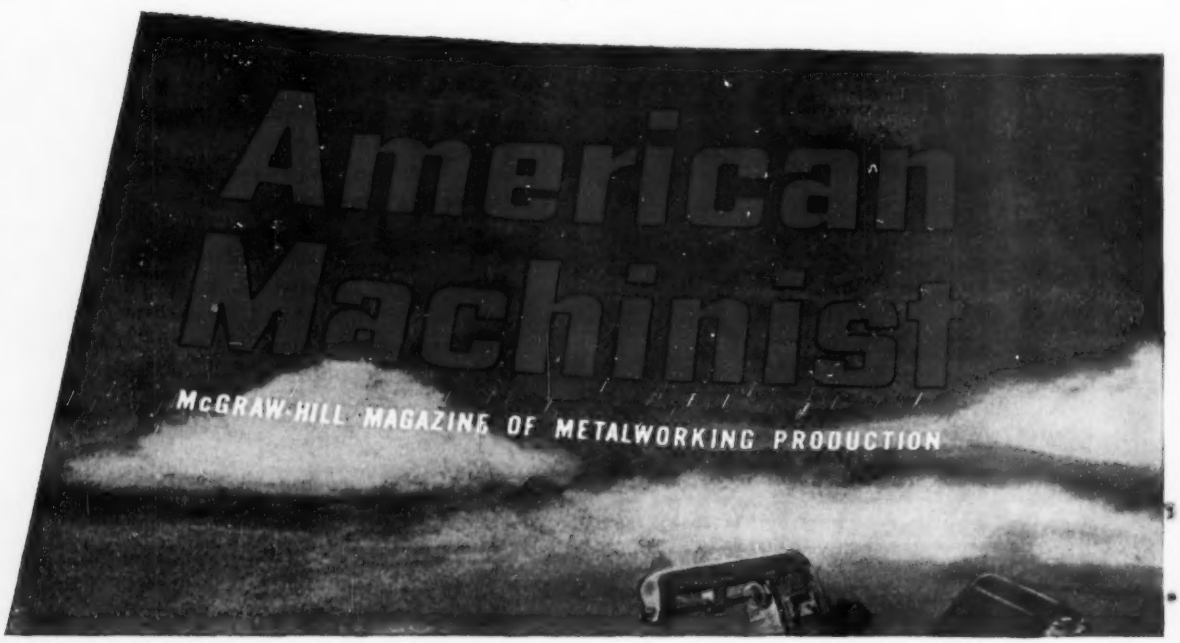

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*Source: *Industrial Marketing* tabulations, January, 1953 issue

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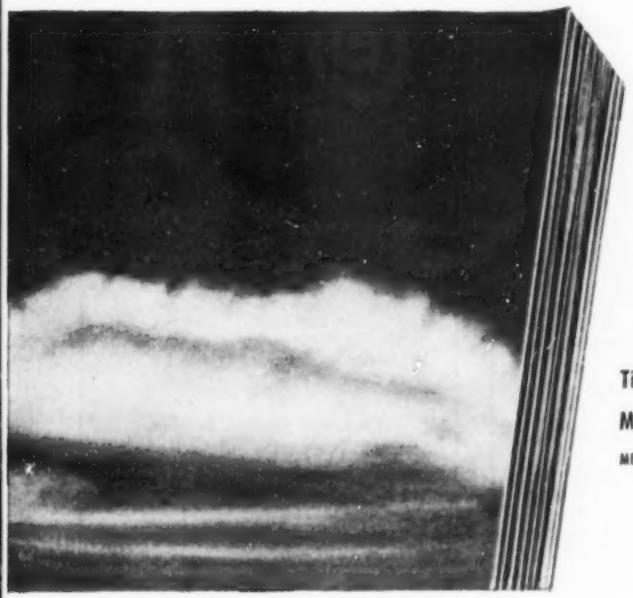

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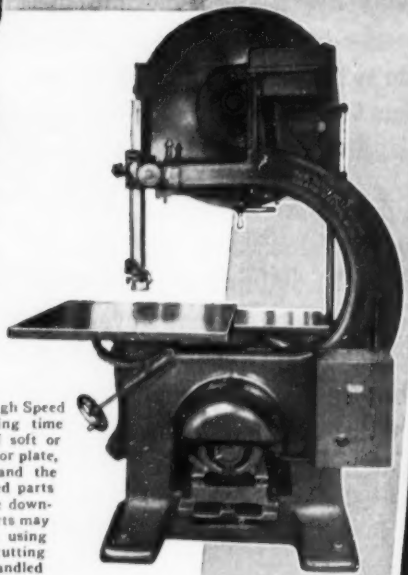

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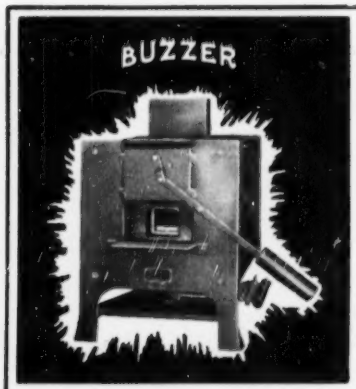

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FIVE FACTORS THAT MAKE

UNIVERSAL SUPER FINISHED

DRILL BUSHINGS THE FAVORITE

IN AMERICA'S LEADING

PRODUCTION PLANTS

1 super finish reduces wear to a minimum

2 blended radius reduces tool hang up

3 100% concentricity and hardness tests assure accuracy

4 knurled head provides quick sure grip

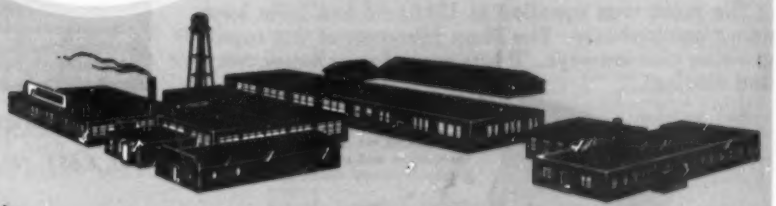
5 complete variety of sizes and lengths

Standard Drill Bushing

Boring Chuck

Mikro-Lok Boring Bar

"Kwik-Switch" Tool Holder



The modern home of finer production tools

Floating Chuck

Standard Collet Chuck

UNIVERSAL ENGINEERING COMPANY

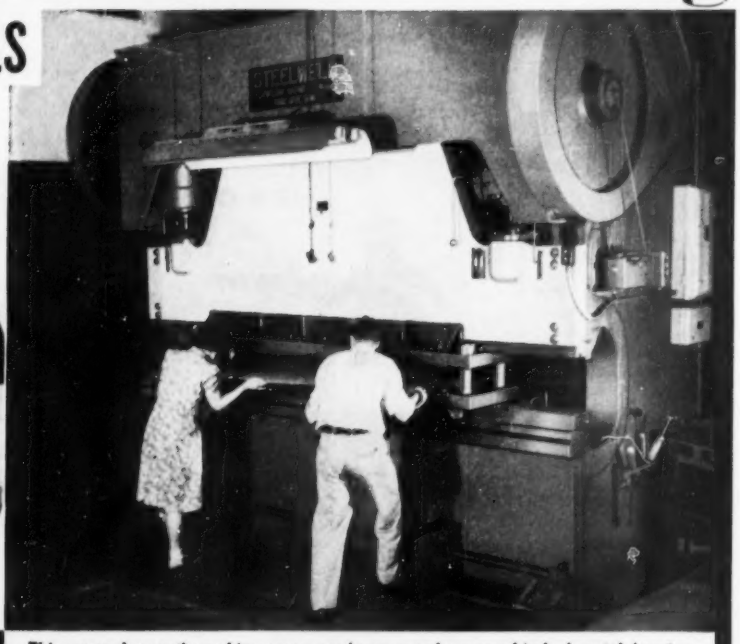
Frankenmuth 1, Michigan

189

blanking and embossing

ACOUSTIMETAL PANELS

4800 panels for 12" x 24" sound-deadening cells are blanked out and embossed per 8 hour day with these dies.



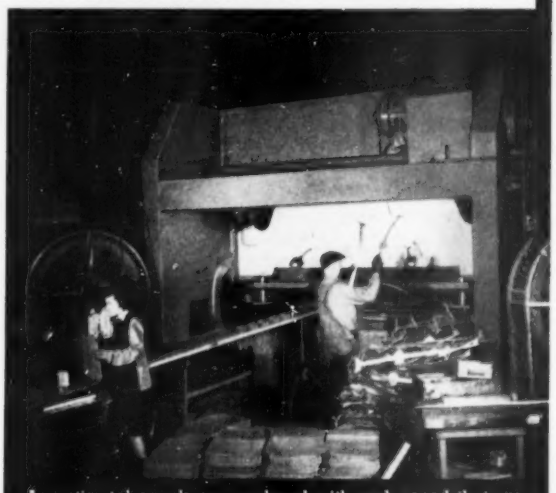
This rugged smooth-working press performs nearly every kind of metal forming operation at Dussing & Hunt, Inc.—bending, forming, flanging, blanking, embossing, and punching. It is easy to change the dies from one job to another or repeat previous runs of work to close tolerances.

Of the many types of work performed on the Model J4½-10 Steelweld Press at Dussing & Hunt, Inc., Buffalo, N. Y., the blanking and embossing of panels for Acoustimetal sound-deadening cells is one of the most interesting.

Large sheets of 26 gauge perforated metal are fed into the dies attached to the bed and ram, by the man operator and his woman assistant. At each stroke of the ram three panels are blanked out and embossed. Six panels for 12" x 24" cells are made from each sheet. 100 sheets are passed through the press per hour. Thus, 600 panels are turned out per hour, or 4800 per eight-hour day.

A large variety of metal parts are produced on the Steelweld. Included are 22-gauge stainless steel tops for deep-freeze cabinets with neatly rounded flanges, fire-proof doors and all-steel industrial doors of 10 to 14 gauge, 14-gauge pressed steel frames, heavy steel channels and many other parts.

The press was installed in 1942 and has been kept going continuously. The Plant Manager of this rapid-growing concern says, "It has proved very satisfactory and efficient."



Acoustimetal panels are produced with such speed that one man is kept busy at the rear of the press removing the scrap and a woman is fully occupied stacking the panels as they roll down the conveyor from the press bed.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

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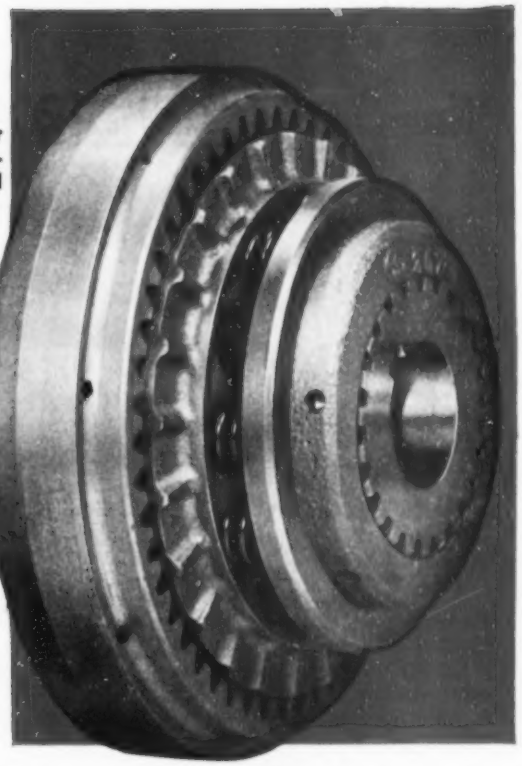
STEELWELD

BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

All castings in this assembly are Meehanite Metal

Cleveland Planer equipped with Hilliard Clutch to avoid damage to heads



FOR DURABILITY IN SERVICE

HILLIARD SLIP CLUTCHES

BUILT WITH MEEHANITE CASTINGS

The Hilliard Corporation—Elmira, New York, manufacture a line of all-purpose slip clutches (Fig. 1) for use in equipment requiring precise control of tension or power applied to a driven machine and in connection with safety devices and load limiting mechanisms. As an example, planers such as shown in Fig. 2 incorporate Hilliard clutches to protect the heads and crossrails against damage in case of obstruction.

Such clutches obviously require component castings which can provide without fail three definite characteristics—namely:

1. **High tensile strength**
2. **Resistance to heat deterioration**
3. **Maximum wearing qualities**

Hilliard designers specify Meehanite castings for all cast parts of this clutch on the basis of experience and the sure knowledge that these properties will be secured regularly.

In addition the use of Meehanite castings gives an assurance of uniformity, ready machinability, and a high freedom from casting defects. Thus production flows are steady and efficient and Quality of the product high.

For facts about how Meehanite castings can improve *your* product, reduce losses and speed production, write for Bulletin #35—"Meehanite Castings Serve All Industry".

Take *YOUR* Casting Problem To
A MEEHANITE FOUNDRY

American Brake Shoe Co.	Mahwah, New Jersey
The American Laundry Machinery Co.	Rochester, New York
Atlas Foundry Co.	Detroit, Michigan
Banner Iron Works	St. Louis, Missouri
Barnett Foundry & Machine Co.	Irvington, New Jersey
E. W. Bliss Co.	Hastings, Mich. and Toledo, O.
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De Laval Steam Turbine Company	Trenton, New Jersey
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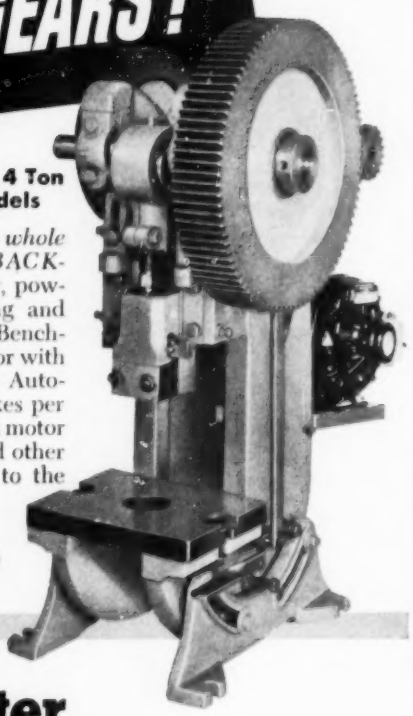

Available in 4 Ton Standard, 4 Ton Deep Throat & 7 ½ Ton Models

Here's something totally new—*a whole line of Benchmasters with BACK-GEARS!* Now you can get slow, powerful strokes for metal drawing and forming operations with typical Benchmaster economy! Feed by hand or with one of the many Benchmaster Automatic Friction Roll Feeds. Strokes per minute range from 40 to 100 with motor pulley variations. Capacities and other general specifications conform to the regular models.

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From the *American Machinist* Library of *Tips for Top Shop Men*

EVERY time you try something new, somebody will call it "a dangerous precedent." Remember that everything new is either wrong or a dangerous precedent to the timid. If you let such reasoning sway you, you'll never do anything new. Only ideas that aren't "dangerous precedents" are the duds.

IF you're planning to introduce a labor-saving method that will displace men, and you know there'll be a kickback, get it set to go anyway. Then wait for "evaporation" — normal quits and dismissals — to cut your working force to the newer, lower level. There'll be no trouble—if your men trust you and the company.

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1. Practical manual showing what improvements time-study actually accomplishes; covers procedures for making the study, explains how work-rating is accomplished, tells specifically how to set up improved working standards that pay off in more and better production. Shows how to break down any given job—how to rate a worker's speed in relation to normal standards—how to deal with all types of employees. **By Phil Carrol, Professional Engineer, 209 pgs. Second edition, 97 illus., charts and tables, $3.50**

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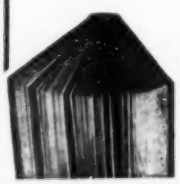

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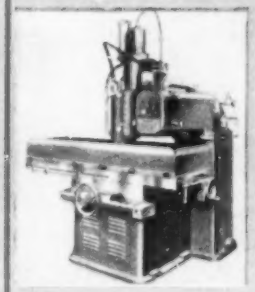
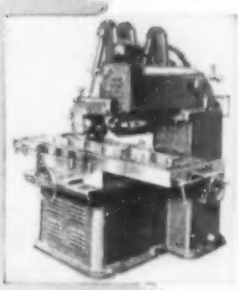
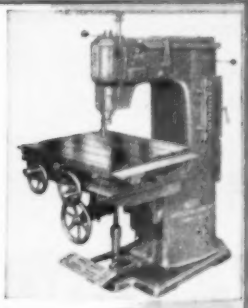
This offer applies to U. S. only.

for high speed non-ferrous milling



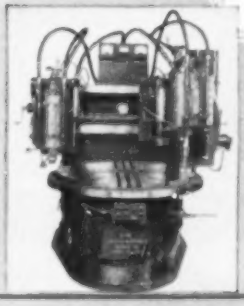
Onsrud A-24 Milling Machines . . . high HP, high speed milling heads, remove metal at rates up to 2½ cubic inches per minute. Table feeds infinitely variable from 11" to 215" per minute. 3,450 RPM horizontal head pivot mounted for contour milling with profile bar control. Write for Bulletin 1139.

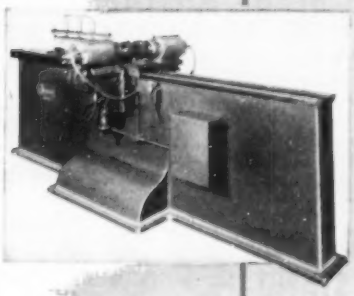




Onsrud A-245 Vertical Milling Machine . . . for light work, manually fed as in sheet profiling and cut-out operations. Two speed 7,500 and 15,000 RPM spindle provides smooth finish and fast production.

Onsrud A-48 Rotary Table Face and Profile Milling Machine . . . for work or work set-up, up to 48" diameter. One pivoted head follows profile bar for contour or straight milling. Second head is preloaded for face milling.





Onsrud A-242 Duplex Milling Machine . . . mills parallel faces on work at one time, using end milling cutters. A high precision machine, built with one, two, or more motors as specified. Write for Bulletin 1128.

Onsrud A-18 Rotary Table Profile Milling Machine . . . dual table design permits loading while second table is in operation. For continuous production. Write for Bulletin 1124.

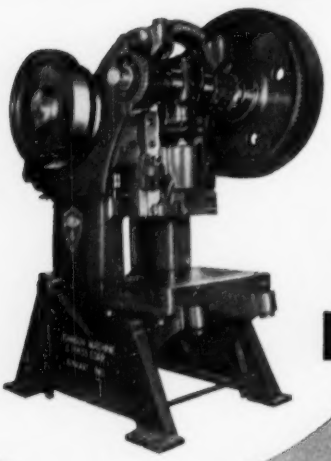
There's an Onsrud high speed, high HP, fast feed milling machine for every type of non-ferrous milling . . . to meet the requirements of every type and size of production part. Your inquiry is invited.

ONSRUD MACHINE WORKS, INC.
3921 Palmer Street • Chicago 47, Illinois

Onsrud

the fastest machines in metal working

EXTRA SERVICE
EXTRA SAFETY
15 MODELS
16 to 90 Ton
JOHNSON
Bonus Built
POWER PRESSES



Will give more service for your production dollar because you can handle larger jobs on smaller presses.

RUGGED • DEPENDABLE • TIME-TESTED

Heavier construction, extra safety features, a list of satisfied users are reasons for an ever-increasing demand for Johnson presses. There's a press for your job, too. Write us today.

Johnson MACHINE and PRESS CORP.
620 W. INDIANA AVE. • ELKHART, INDIANA

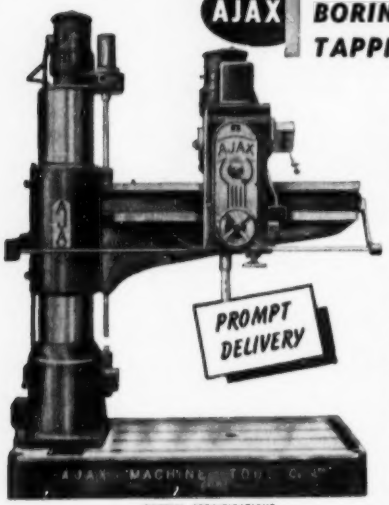
FAST, ACCURATE AND POWERFUL HYDRAULIC SHEARING IS HERE...
for mild steel up to 10 gauge

the HYDRA-SHEAR

The Hydra Shear surpasses all others in its field for smooth operation . . . no gears or clutch . . . less curl and burring . . . cannot be overloaded. Write for specifications.

Made in Halifax, England – Britain's Machine Tool Center!

AJAX RADIAL DRILLING BORING and TAPPING MACHINE



. . . Featuring internal pillar with full length sleeve to eliminate end lift of arm. Extreme rigidity is assured with easy and positive locking arrangement! 3" diameter drilling capacity in cast iron.

The Ajax Radial Drill meets all the demands of the best high speed steel and carbide tipped tools. High quality materials and workmanship together with the utmost ease of handling the centralized controls guarantee a long and trouble-free life.

Write today for full specifications.

PARTIAL SPECIFICATIONS

Max. radius of spindle from ctr. of col.	5'0"
Saddle traverse along arm	3'2"
Baseplate:	
Length of working surface	4'9"
Width of working surface	3'0"
Height of working surface	9"
#4 Morse taper:	
Spindle speeds (8)	60 to 1114 rpm

Sales Territories Open

MOREY for machine tools!
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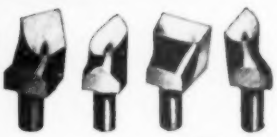
APEX TOOLS
INSERTED-BLADE MILLING CUTTERS AND SINGLE-POINT TOOLS FOR ALL METAL-CUTTING NEEDS

APEX TOOL BITS FIT MOST STANDARD HOLDERS



If you haven't yet changed to Apex, you can begin to get acquainted by using Apex Bits in your present holders. The Apex line includes Single-Point Round Shank (as shown) and Shankless Serrated — plus Inserted-Blade Milling Cutters of all different styles. Write for catalog.

PROMPT SHIPMENT FROM OUR LARGE, COMPLETE STOCK

APEX TOOL & CUTTER CO., Inc., Shelton 10, Conn.

Cold Forging...

. . . THE COST-SAVING SOLUTION . . . . . FOR PARTS LIKE THESE

Did you know that many parts such as those pictured can be cold forged?

Through engineering and production methods which Allied employs, special cold forged parts can be produced in many unusual forms and sizes. In numerous instances, parts never before considered for this type of production have been manufactured by Allied.

Tolerances as close as are required for most machined parts can be secured. Cold forging processes invariably provide greater strength and durability in the parts produced. Of most importance, in high volume production, your part costs can be reduced considerably.

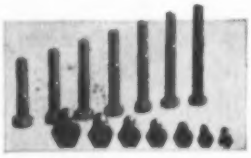
Send your part prints to learn what Allied can do for you.

Other Allied Products

HARDENED AND PRECISION GROUND PARTS • SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • ALLITE (ZINC ALLOY) AND PLASTIC DIES • JIGS • FIXTURES • R-B INTERCHANGEABLE PUNCHES AND DIES

STANDARD HEXAGON HEAD CAP SCREWS

Also produced in Allied's Plant 1 are standard hexagon head cap screws. They are of uniformly high quality and are priced competitively. Your inquiries concerning these products will receive prompt attention.



PRECISION • EXPERIENCE • DEPENDABILITY

ALLIED PRODUCTS

ALLIED PRODUCTS CORPORATION

DEPT. D-11 • 12605 BURT ROAD • DETROIT 23, MICH.

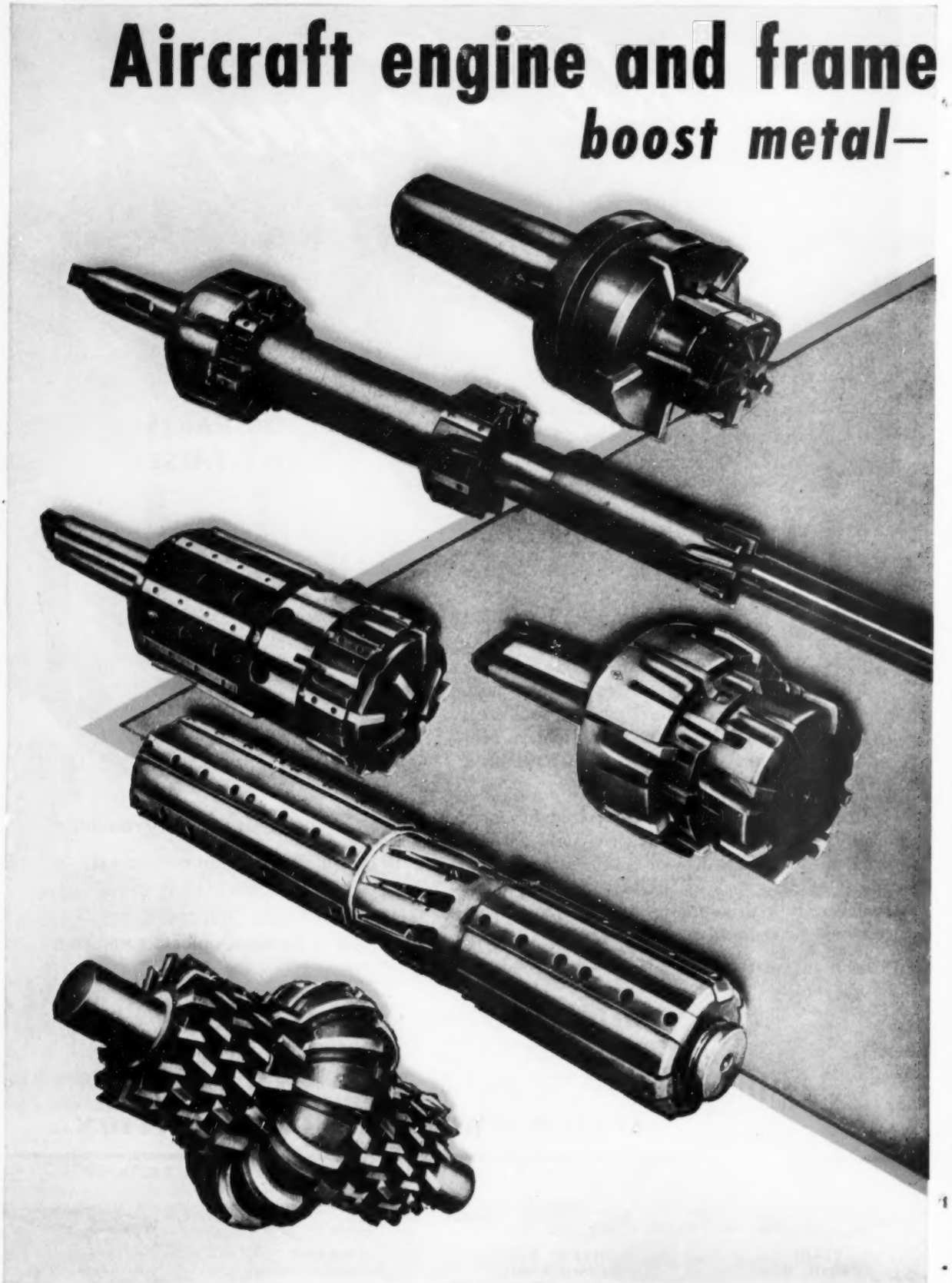
PLANT 1
Detroit, Mich.

PLANT 2
Detroit, Mich.

PLANT 3
Hillsdale, Mich.

PLANT 4
Hillsdale, Mich.

Aircraft engine and frame *boost metal—*



manufacturers
cutting operations with . . .

one-pass OK multiple diameter tools

Over fifty percent of O K tool orders from the aircraft industry are for combination cutters, designed to perform two, three and four operations with one pass of the tool. These tools take bulldog-bite rough cuts, or cobweb-thin, micro-finish cuts, with no restrictions as to metals, which run from stainless steel for jet-engine parts to heat-treated aluminum for cylinders and highspeed steel for triple-step lathe chuck jaws. Former production records are demolished! Where, yesterday, five pieces on the floor, was considered good; today, you find 50 pieces, inspected and passed.

TYPICAL MULTI-PURPOSE TOOLS

Designed from your blueprints or sample and specifications
COMBINATION BORING, REAMING AND CHAMFERING HEADS
BORING AND FACING MILLS FOR RADIAL DRILLING
PILOTED TREPANNING AND REAMING TOOLS FOR DEEP HOLE WORK
GANG CUTTERS FOR SLAB-MILLING
CHROME-MOLY PLATES FOR PROP BLADES

BUILT WITH MORE BEEF IN THE BODY

To better take the punishment of carbide milling O K tools, by virtue of their simple, two-component design are huskier in the body, size for size; thus permitting closer blade spacing for close tolerance work, and heavier blades for hogging jobs. Blades are wedge-shape* blocks. Blades, once seated and driven home, never budge. Mated serrations prevent lateral movement; provide an accurate adjustment to compensate for wear. Grinding is minimized to .005" per blade by fine-tooth features. Bodies are not weakened with cutouts for locks, screws, pins, gibs or gadgets. Of these, O K can nicely do without.

FREE CATALOGS

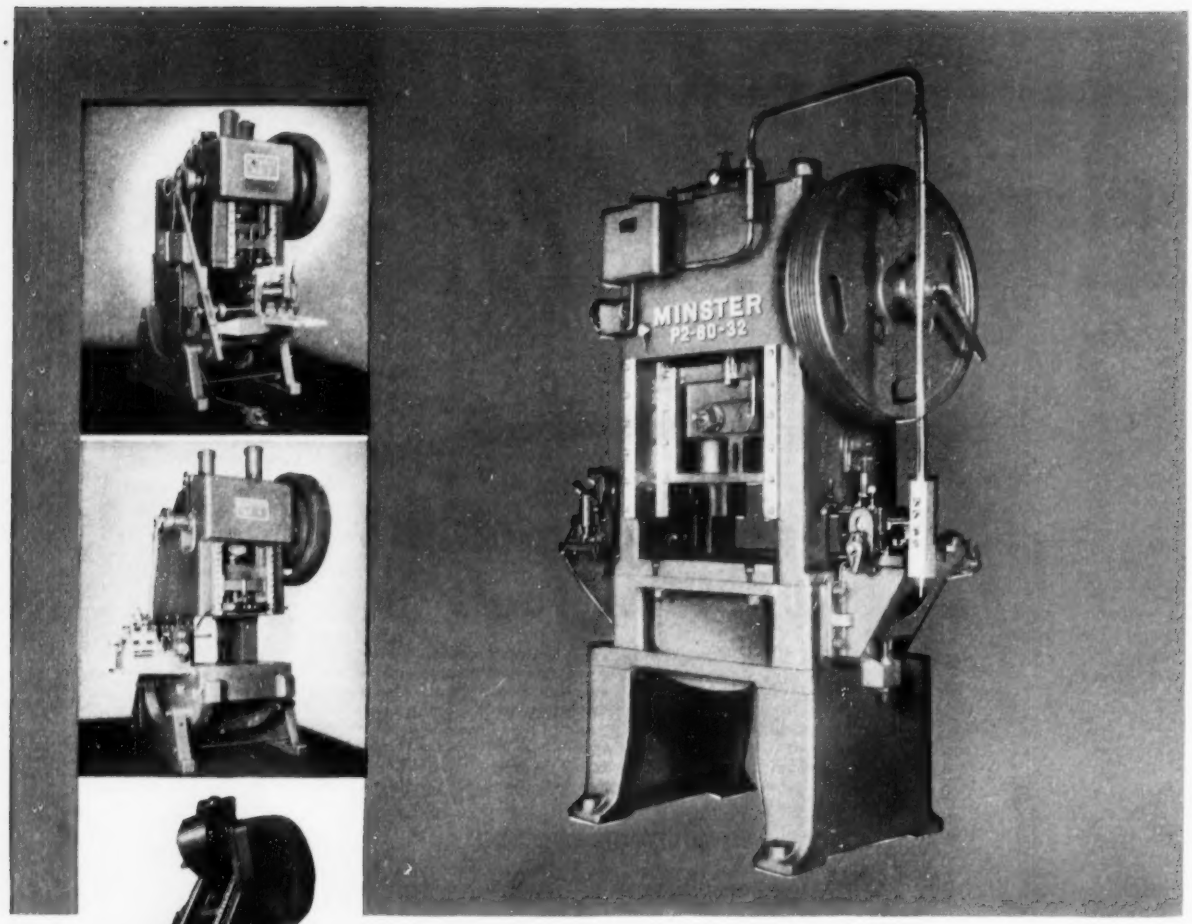
"Modern Milling Cutters for Modern Milling Machines"
"America's First System of Insert Single Point Tools"

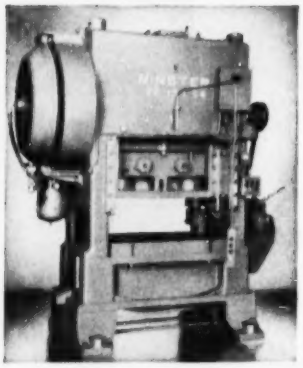
THE O K TOOL COMPANY
Milford, New Hampshire

OK

modern milling cutters
for modern milling machines

* The wedge is the world's strongest mechanical device.





FEED IT AUTOMATICALLY WITH A

MINSTER

Take a long, close look at automatic press feeding. Here may be the answer to (1) needed production increases, (2) more efficient plant layout, and (3) easing of manpower problems.

Single roll feeds, double roll feeds, stock straighteners, oilers, scrap cutters, coil reels . . . all types of feeds and auxiliary equipment can be furnished on the many types of Minster presses.

Even more important, Minster presses are built with the extra rigidity and accuracy so necessary for automatic production of high accuracy parts. Minster's P2 *Piece-Maker Presses*, in particular, offer a standard of press alignment accuracy never before achieved. Intricate stampings with finest progressive dies are now a production reality.

Get the facts. Send part samples and die drawings for our press and feed recommendations.

MINSTER
FIRST IN Press DESIGN

THE MINSTER MACHINE CO., MINSTER, OHIO

SOME ANSWERS TO YOUR SHOP QUESTIONS ON

deep drawing

STRAIGHT-CHROMIUM STAINLESS STEELS

Single draw forms this sink from Type 430 Stainless Steel

This kitchen sink fabricated by a prominent manufacturer, is a striking example of the deep drawing properties of U·S·S 17 (Type 430) Stainless Steel.

It was formed from a 30" x 32" blank of 20-gage Type 430 Stainless Steel *in a single draw* without post-annealing.

This sink was formerly fabricated from a grade of nickel-bearing Stainless Steel. But restriction on the use of this grade turned attention to readily-available straight-chromium Stainless. It was found that this product could be fabricated from U·S·S 17 Stainless without changing the design.

This is another in a series of advertisements discussing the straight-chromium grades of Stainless Steel from the standpoint of fabricating performance. Other operations that will be considered in future discussions are machining, cutting, spinning, welding and finishing.

DEEP drawing of such straight-chromium grades of Stainless Steel as U·S·S 17 (Type 430) is being carried out successfully by a growing list of fabricators. Their experience indicates you need expect no difficulty if a few simple principles are kept in mind.

Straight-chromium grades have a lower ductility and a higher yield strength than the nickel-bearing grades. In fact, their drawing characteristics are more like that of carbon steel.

As a result, die clearances and hold-down pressures should favor feeding in of the metal rather than stretching. Stock to be worked should be at least room temperature and it may be helpful to warm the blanks in boiling water. Well-lubricated dies should be used at all times.

In the first draw, reduction should be held to 20 to 25% with 35% as the maximum in special cases. Subsequent draws should not exceed 15%. Annealing between draws may or may not be necessary.

In connection with annealing, it should be remembered straight-chromium grades anneal at much lower temperatures than nickel-bearing grades of Stainless Steel. Consequently, there will be only slight scaling and no difficulty in removing it.

In every case, it will pay you to consult with our representatives concerning straight-chromium Stainless Steels. They will examine the job from the standpoints of end use and shop equipment and give you their recommendations.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
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U·S·S STAINLESS STEEL

USS

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

3-494

UNITED STATES STEEL

Uniform Rake Angles on Taps Can Save You Money

The importance of rake angles on milling cutters, lathe, planer, and shaper tools has been recognized for many years. Yet the importance of uniform rake angles on the cutting edges of taps is frequently overlooked.

ADVANTAGES OF UNIFORM RAKE ANGLES

Case history studies in plant after plant show that rake angles that stay the same —after many repeated sharpenings—provide much greater accuracy and uniformity in work produced. They also result in greater production per tap and big savings in tap costs.

THE ROLE OF BLAKE EQUIPMENT

The Blake Flute Grinder and Blake Chamfer Grinder are the only machines which enable you to control accurately the rake angle of any tap. By using these two machines, you can duplicate a rake angle which was found previously to be satisfactory. The same rake angle also can be given to as many other taps as desired.

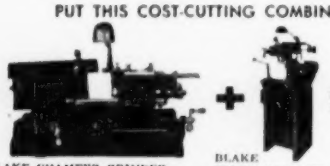
BLAKE EQUIPMENT IS DESIGNED FOR PRECISION! Photograph shows construction of crank shaft unit of chamfer grinder workhead which helps make precision sharpening possible.

THE MONEY-SAVING STEP IS YOURS

You have the opportunity to greatly increase your production per tap and sharply reduce your tap costs by using the Blake precision sharpening method in *your* plant. To get more facts on the subject, write us for the interesting *Machinery* article, "Why Taps Should Be Sharpened Precisely". Illustrated bulletins on both Blake machines are also yours for the asking.

IT'S A FACT! YOU CAN REDUCE YOUR TAP COSTS 50 to 75% by installing Blake tap sharpening equipment and sharpening your taps as you do other metal cutting tools.

PUT THIS COST-CUTTING COMBINATION TO WORK FOR YOU NOW!



BLAKE CHAMFER GRINDER (Described in Bulletin 552) BLAKE FLUTE GRINDER (Described in Bulletin 651)

ACCURATE, TRUE-CUTTING TAPS
LESS TAP BREAKAGE
600% MORE PRODUCTION PER TAP
UP TO 75% REDUCTION IN TAP COSTS

Write for details about both machines!

EDWARD **BLAKE** COMPANY 435 CHERRY ST., WEST NEWTON 65 MASSACHUSETTS

BLACK DIAMOND PRECISION DRILL GRINDERS . . . WALTHAM CUTTER SHARPENERS . . . SURFACE FINISH STANDARDS

HOW TO REDUCE THE COST OF THIN METAL STAMPINGS

is a problem to which many good answers are available. You'll find some excellent ones in *American Machinist's* special report by that title . . . and 15 cents will bring you your copy.

Write to:
Reader Service Department, *American Machinist*
330 W. 42nd Street, New York 36, N. Y.

Microstructure determines tool life . . .

U. S. AIR FORCE MACHINABILITY REPORT 1951

This *American Machinist* Special Report summarizes recently released data from the $100,000 machinability - research project conducted by Curtiss-Wright and other companies for the United States Air Force.

You will find particularly valuable, as a key to estimating the tool life cutting speed of any steel, this report's comprehensive chart of 12 steel structures under four metallurgical conditions.

Copies of this 8-page Special Report, which includes information on machinability as influenced by heat-treating and alloying, are available at 15 cents each.

Write for an editorial reprint order form listing titles and costs of other informative Special Reports.

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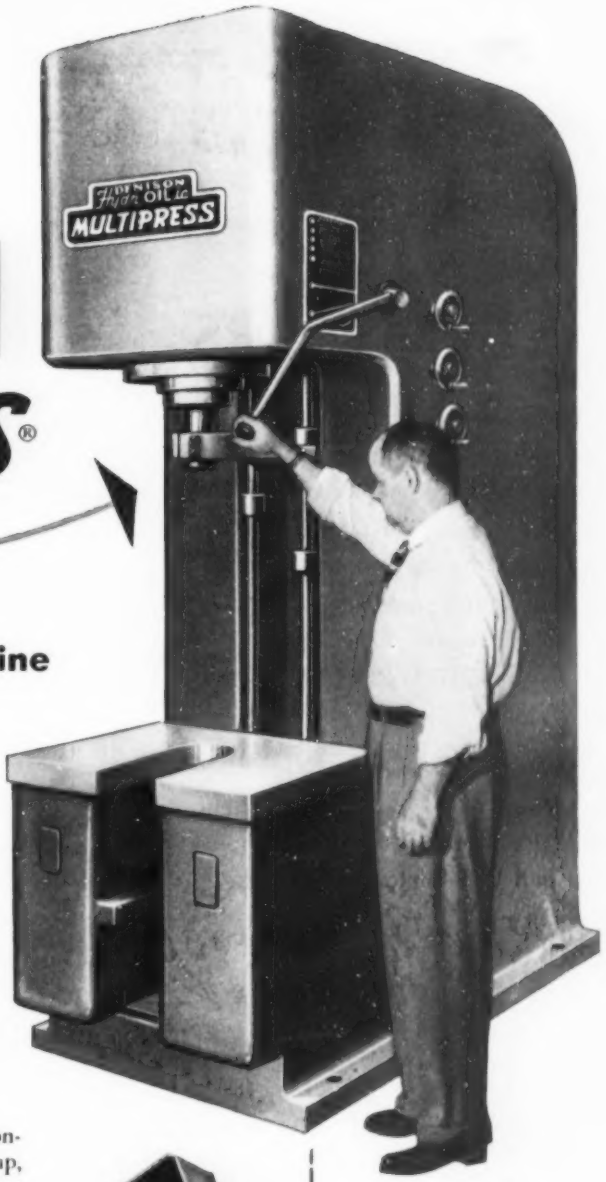
NOW

75-TON MULTIPRESS®

MODEL QA75



Big-job Multipress added to line

NOW — *all production-boosting Multipress advantages can be applied to jobs calling for pressures up through the 75-ton range!*

MANUAL OR AUTOMATIC CONTROL: A choice of nine control valves offers manual or automatic operation to suit any need. Dual-push button or hand-lever controls available for extra safety. Hold down and other operating sequences are easily provided.

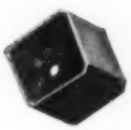
VERSATILE RAM ACTION: The 15-inch maximum ram stroke of the new 75-ton Multipress is fully adjustable for both upper and lower limits. Pressing and approach speeds are *independently* adjustable. Continuous cycling of automatically controlled ram may be set for either distance or pressure limits.

TOUCH CONTROL: With the New Multipress servo control added, the ram starts, stops, reverses, speeds up, slows down, or applies pressure *in direct relation to every action on the hand lever.*

INDEX TABLE FEEDS AND OTHER ACCESSORIES: Six- and 12-station Multipress Index Tables can be used for fast, automatic, multiple-point feeding or assembly of parts. Many other automatic feeds, auxiliary attachments and work-speeding accessories also available.

The 75-ton Multipress has a 30-inch daylight opening (gap) . . . 34-inch work table width . . . 13-inch throat depth. Height, only 106 inches. *Write* today for full details on this versatile, big-job Multipress. *Other sizes and capacities from one to 50 tons.*

DENISON Hydr OIL ics



After switching to Multipress, only three draws were needed to form heavy phosphor-bronze housings that required six operations by the former method.

With each ram stroke, Multipress puts 120 close-tolerance notches around a thin-walled compass bezel. Averaging 600 per hour, rejects dropped to .0025%.

With quick, accurate "one-shot" assembly of this 6-part metal and plastic switch component, Multipress boosted output 80% and cut scrap loss 84%.

Multipress increased production speed to 3½ times the previous rate, in staking metal pins in a precision part of a famous-make 3-speed record changer.

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Your best work
Your fastest work

WITH THESE

ACCURATE TAPS

Today's State of Emergency calls for a doubling of efforts to conserve. An important step in this direction is the use of REIFF & NESTOR Taps. Your best work, and fastest work, is accomplished by their application, as industry has discovered through the use of REIFF & NESTOR Taps for the past forty years.

Your machine set-ups will run longer because of the quality heat treating and accurately controlled grinding that puts L-I-F-E into our products.

Remember, your best work results only if your Taps are perfectly accurate. REIFF & NESTOR Taps assure you of this.

REIFF & NESTOR COMPANY

Tap Making Authorities

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PUT SMALL JOBS ON THIS **LINLEY MACHINE**

and save your larger machines for heavier work.

YOU'LL BE SURPRISED! at the extremely low first cost and the vitally important jobs that this little precision machine can do. It will pay you to get our accuracy information on this machine which has 6" x 10" table movement and 7' x 17½" table size.

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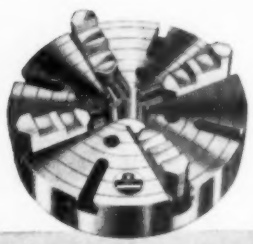
this name is your guarantee of dependable performance . . . backed by 102 years experience in the manufacture of the world's finest chucks.



See your Distributor for a complete line of chucks by Horton — pioneer in J-Type chucks for jet engine machining.

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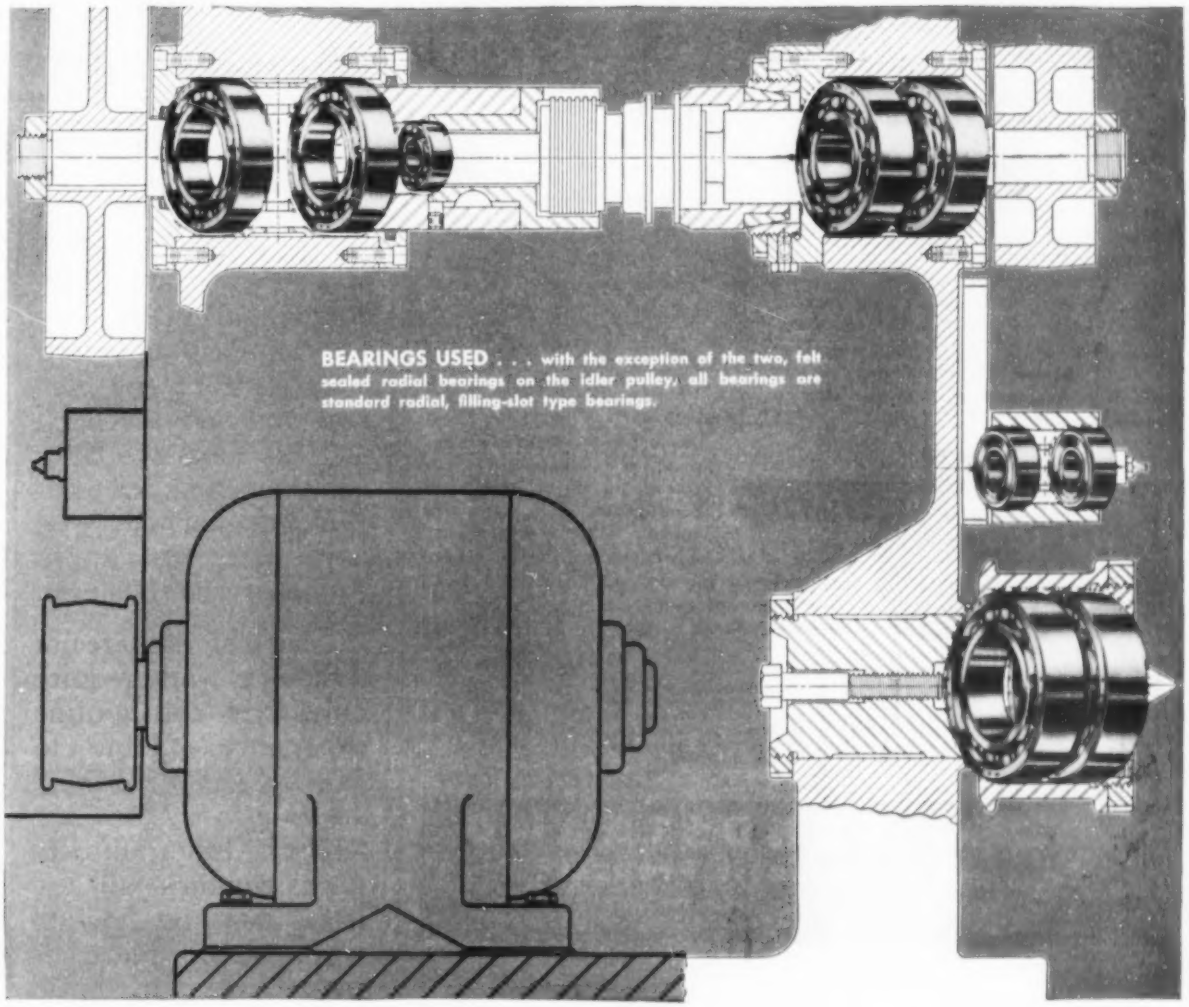
Modernize by Motorizing!

RIGHT ANGLE to a grinder problem


BEARINGS USED . . . with the exception of the two, felt sealed radial bearings on the idler pulley, all bearings are standard radial, filling-slot type bearings.

Here's an idea that may be helpful to you, if you have a problem of motorizing a belt-driven machine. It has already extended the useful service life of a grinding machine by eighteen years . . . and the machine is still in operation.

Building the drive around the motor seemed to be the best way to convert the grinder. This right angle arrangement includes nine Fafnir Ball Bearings . . . all grease lubricated. Speed range of drive, 160 to 720 r.p.m. During World War II, the converted machine was in operation 24 hours a day . . . now it's on two, 8-hour shifts daily. No bearing replacements have been made since the conversion.

Here's another example of the Fafnir "attitude and aptitude" . . . a way of looking at bearing problems from the user's viewpoint, an aptitude for providing the most effective solution based on more than 40 years' experience. Whatever your bearing problem, a few minutes spent with a Fafnir Representative may help you solve it successfully. The Fafnir Bearing Company, New Britain, Conn.

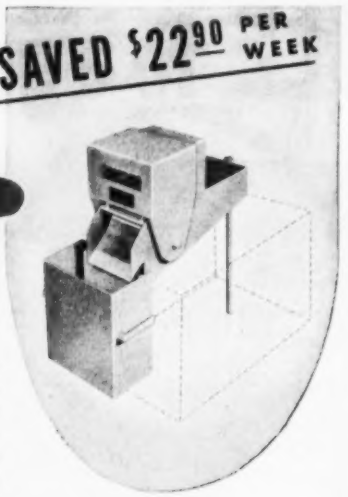
FAFNIR

BALL BEARINGS

MOST COMPLETE LINE IN AMERICA

How One Manufacturer SAVED $22.90 PER WEEK

WITH A SUNDSTRAND MAGNETIC COOLANT SEPARATOR



Cleaning the coolant tank and replacing coolant can be costly. But when done right, savings can be accummulated. In this case the coolant tank had been cleaned twice *daily*. It is now cleaned twice *weekly* with a savings per week of $22.90. Cost of the Sundstrand installation is approximately $475.00. The unit requires no attention and little or no maintenance. Why not pick up dollars like this?

EASILY INSTALLED WITHOUT ADDITIONAL PIPING

An important feature of this magnetic coolant separator is that it can be dropped into position on most open type coolant tanks. No additional piping is required. Install one on your present equipment and compare its efficient operation with other units.

FREE ADDITIONAL DATA — This folder will give you the complete facts on the Sundstrand Magnetic Coolant Separator. Write for your copy today. Ask for bulletin 129-M.

SUNDSTRAND POWER-GRIP

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Magnetic Products Co.
Division of Sundstrand Machine Tool Co.
1020-9th ST • ROCKFORD ILLINOIS

From the *American Machinist* Library of *Tips for Top Shop Men*

ONE old-time shop manager, taking over from a tough and unapproachable predecessor, changed the atmosphere completely by saying: "When you have a problem, come in and see me. There's no frost on my doorknob!"

THERE'S always a way. Remember the college that got a bequest of several hundred thousand dollars for a new girls' dormitory — which the will stipuated must be surrounded by a 20-ft wall. A smart trustee suggested the bequest be accepted and the dorm be built—with the wall in a 20-ft trench.

How to Work Clad Materials

Proper application of clad materials can cut costs and save scarce metal. Output of clad materials has more than doubled since 1946 . . . has climbed to more than 23,000 tons per year and may reach 1,000,000 tons by 1960. Clad materials offer advantages that may well have profit-wise applications in your business.

Clad materials are not difficult to work, require only care and routine experience. "How to Work Clad Materials," an *American Machinist* Special Editorial Report, contains all the latest facts on how to work clad materials most efficiently and profitably. This 16-page report, complete with informative drawings, diagrams, and photographs, is still available for only 25¢ a copy. Write to Reader Service Department:

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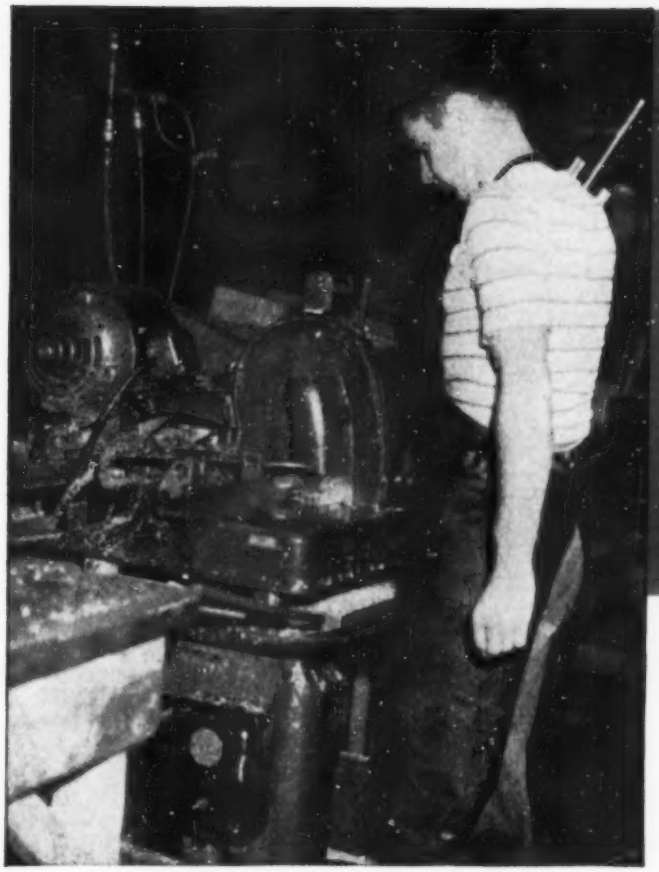


At Orange Screen Co., with an output of 900 pieces per hour, cost of making mitre cuts on aluminum frames on double Delta cut-off saws is only 2.9 cents each, including all charges for depreciation, interest on investment in tools, maintenance, power and labor.

DELTA Cut-Off Saws mitre-cut aluminum frames for 2.9¢* each

*Includes all charges for depreciation, interest on investment in tools, maintenance, power and labor

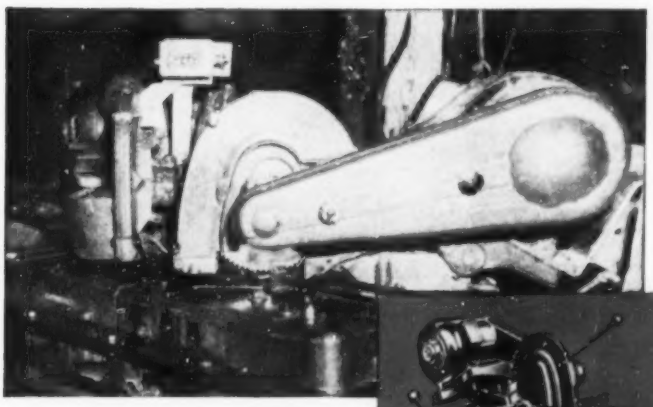
HERE'S HOW ORANGE SCREEN CO. SAVES

Delta abrasive cut-off saws set in pairs and specially tooled make the mitre cuts on both ends of aluminum window frame members at the same time at a cost of 2.9 cents per piece at the Orange Screen Co., Dover, N. J.

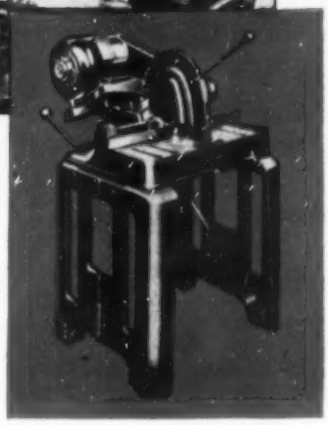
Says E. J. Belliveau, chief manufacturing engineer: *"These set-ups have worked like a charm for nine years. We need their high speed —4000 rpm spindle speed and 10,500 fpm surface speed. An operator—man or woman—can feed an 18' extrusion 1½" x 3⅝" up to 3" x 1" and turn out 900 pieces per hour. In spite of this fast pace, women operators regularly get incentive production 30 to 80 per cent above base.*

"As a matter of fact, we've standardized on Delta tools all over the plant. Our Delta tools— 20 cut-off machines, 27 drill presses, 3 belt sanders, 5 band saws and 2 circular saws— all have a fine record for accuracy, and with their small initial cost and long life, depreciation is extremely low."

There it is—history repeating itself. Another alert management that's found that low-cost, adaptable, accurate Delta tools out-produce and out-profit far more costly tools. It's easy to find out how you, too, can get these production savings. Talk to your Delta dealer listed in the yellow pages of your phone book under "Tools" or "Machinery." And send for the most useful tool catalog you can have in your desk—Delta AB-Catalog. Delta Power Tool Division, Rockwell Manufacturing Co., 618C North Lexington Ave., Pittsburgh 8, Pa.



Orange Screen Co. keeps blades sharp, uses 10" steel blades that average 36,000 cuts between sharpenings. Maintenance in nine years has been negligible, they report.

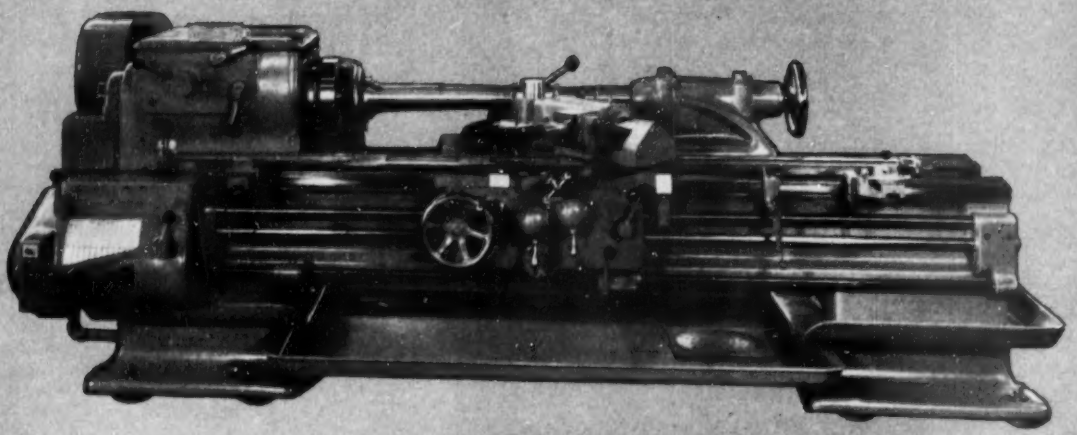


DELTA MILWAUKEE
DELTA QUALITY MAKES THE DIFFERENCE

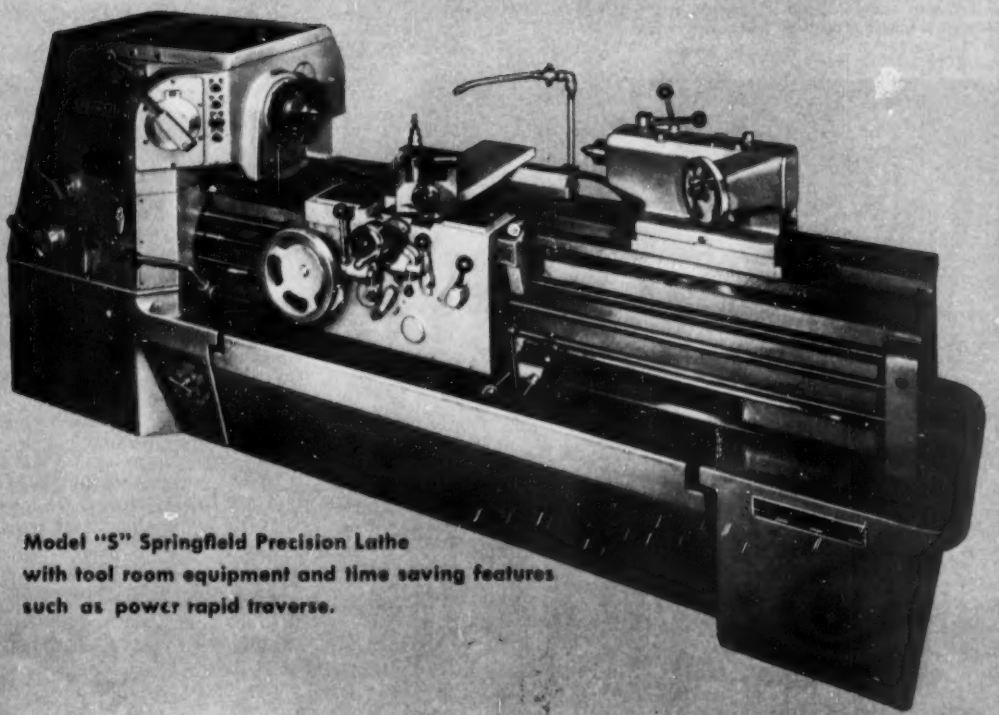
DELTA QUALITY POWER TOOLS
Another Product of **Rockwell**

SPRINGFIELD

TURNING—CONTOURING—PROFILING—ENGRAVING—



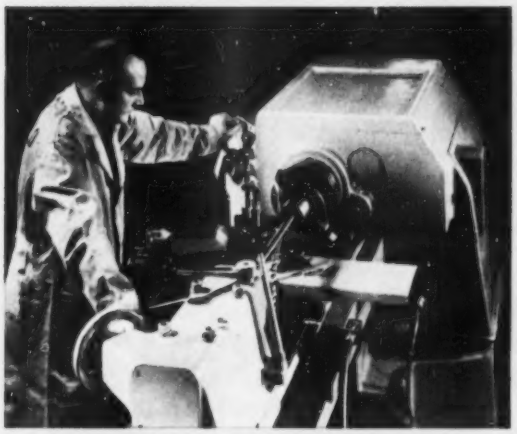
Model 160 Springfield Precision Lathe with Hydraulic Contouring Attachment for economical production of turning, boring and facing operations involving contours.



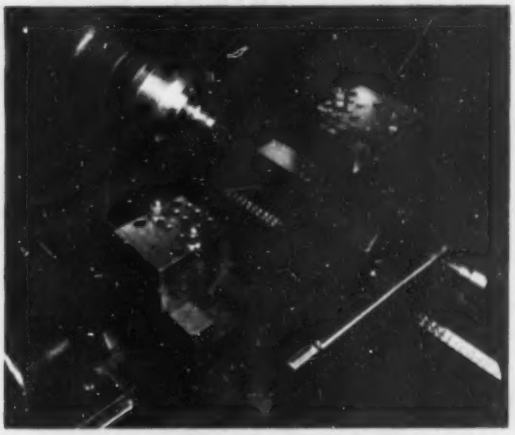
Model "S" Springfield Precision Lathe with tool room equipment and time saving features such as power rapid traverse.

LATHES

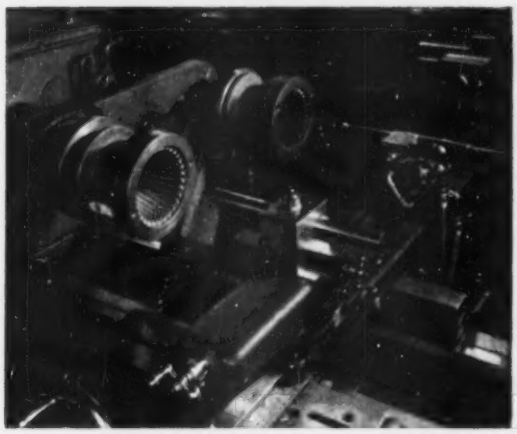
REPRODUCING — BORING — THREAD CHASING — RELIEVING



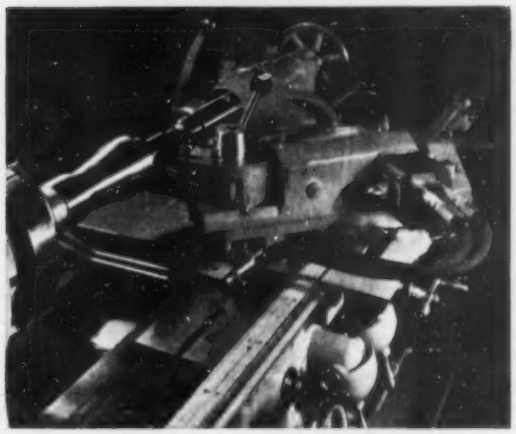
EFFORTLESS OPERATION



CUSTOM TOOLED



INTRICATE REPRODUCTION



PRODUCTION CONTOUR TURNING

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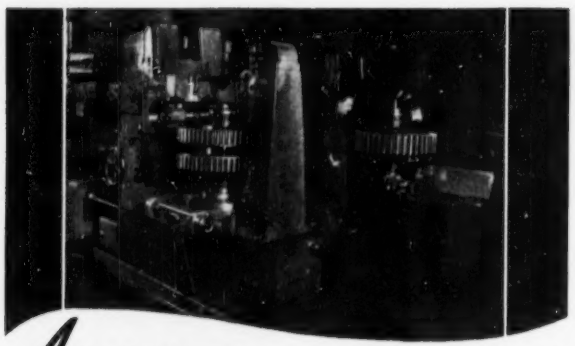

Accuracy.. IN THE MAKING!

The crank arm header gears shown above being cut in pairs, will be identical twins in accuracy and long life, thanks to Stahl's specialized experience, plus the latest and finest in precision equipment. All types of gears, in any size or quantity, produced accurately, economically, promptly. If it's gears you need, get Stahl's estimate first.

SPURS TO 72" PD, 1 DP

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SPIRAL, HELICAL and WORM GEARS TO 48" PD, 2 DP

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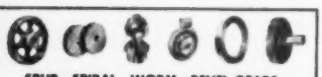

SPUR - SPIRAL - WORM - BEVEL GEARS

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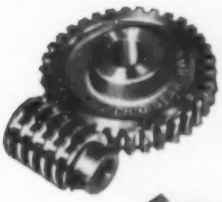
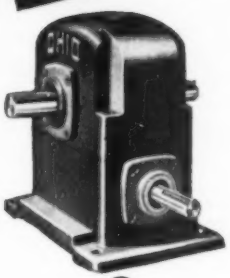
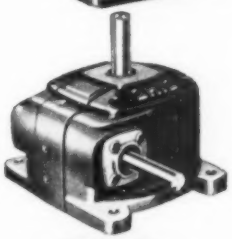
STANDARDIZE WITH OHIO STOCK GEARS AND SPEED REDUCERS

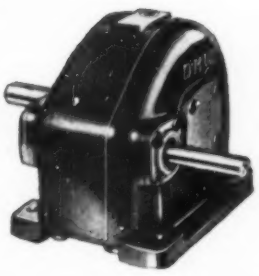


Meet today's tough production schedules "right off the shelf" with **OHIO** Gears and Speed Reducers. One glance through the pages of an Ohio Gear catalog and you immediately find ways to cut the cost and improve your product. Your production steps up automatically once you have adopted Ohio Gear as a "stock" source of supply.

Take advantage of Ohio Gear's years of engineering experience in every type of gear and speed reducer, the choice of thousands of engineers for the design and maintenance of power transmission equipment — Ohio Gear is prepared to meet your most difficult requirements. Call your nearest distributor or write direct.







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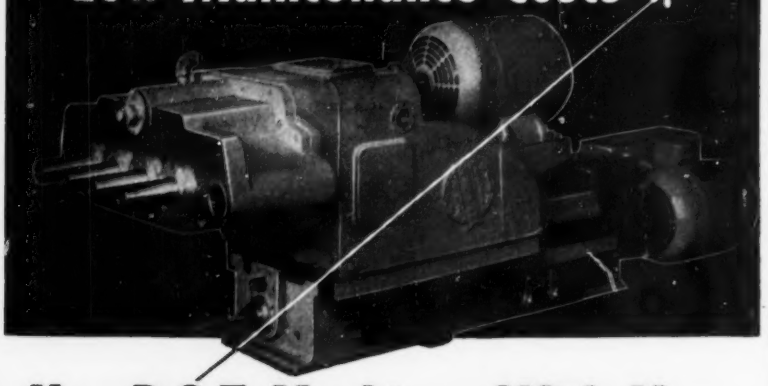
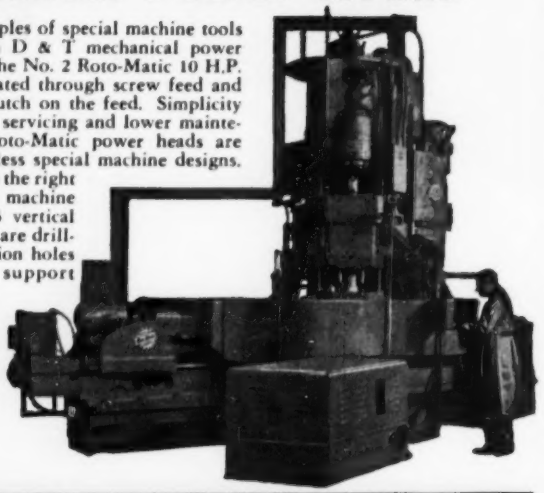


Use D&T Machines With New Mechanical Power Heads

Here are two good examples of special machine tools designed and built with D & T mechanical power heads. Shown above, is the No. 2 Roto-Matic 10 H.P. head. All sizes are operated through screw feed and have overload release clutch on the feed. Simplicity of design makes for less servicing and lower maintenance costs. D & T Roto-Matic power heads are readily adapted to countless special machine designs. For instance: Machine to the right is a 6 station indexing machine with 3 horizontal and 3 vertical power heads. Operations are drilling and reaming suspension holes and king pin holes in support arms for power heads.



Free Data

Is available on the complete line of D & T machines. Ask for Bulletin 1000.

DAVIS and Roto-Matic THOMPSON

Davis & Thompson Company

6411 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN

Correction

In the Buck Tool Company advertisement on page 540, January 19, 1953 issue, of American Machinist, the first paragraph mentions ".005 precision".

This should have read ".0005 precision".

We regret this typographical error.

AMERICAN MACHINIST

HOW to cut your

TAPPING COSTS

• Tapping trouble in many cases can be traced to the improper choice of the tap for the job. Proper tap selection begins with analysis of the thread to be cut . . . material, size, tolerances, character, ultimate use, and number.

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This *American Machinist* Special Report will help you cut your tapping costs per threaded hole. This valuable article provides all the latest data on proper tap selection and application . . . from leading tap manufacturers and their largest users.

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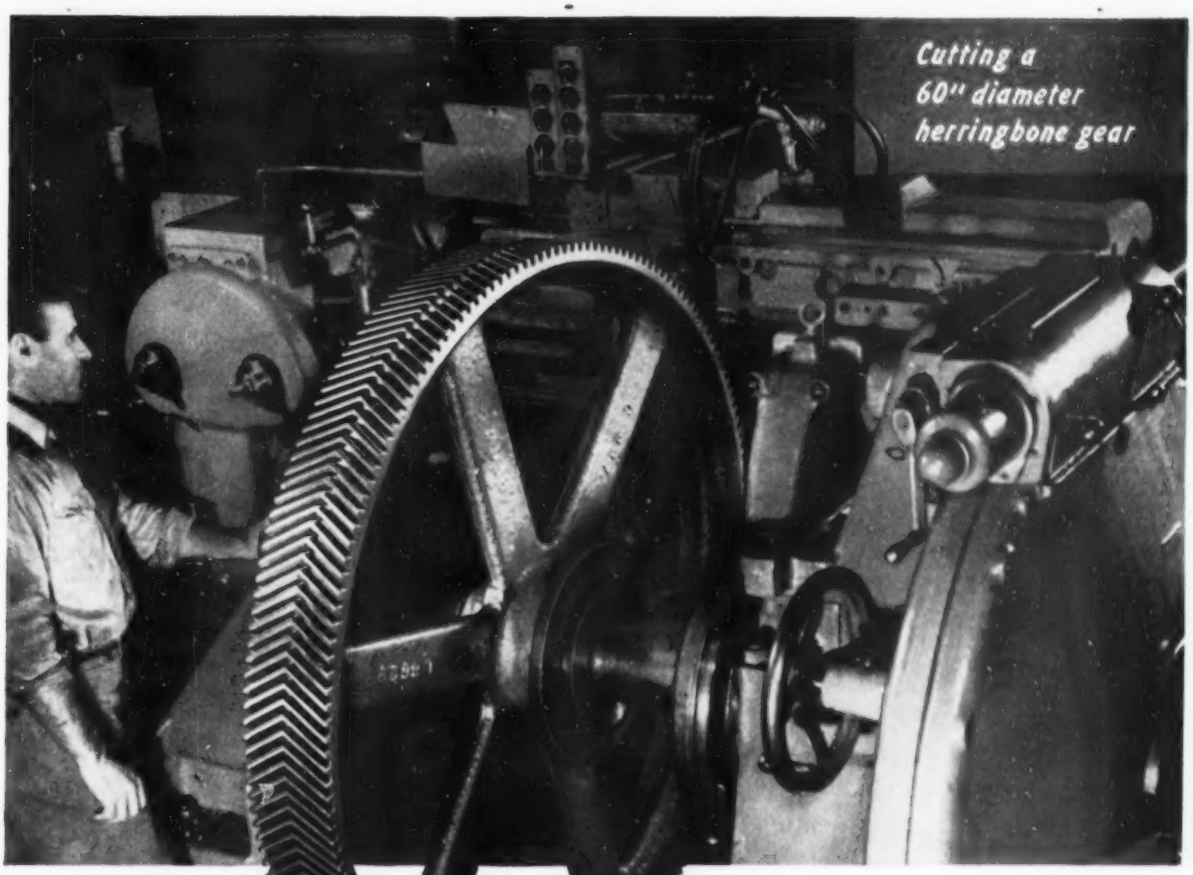

Herringbone gears

Cutting a big herringbone gear like this isn't particularly difficult —that is, if the right equipment and experienced operators are available. Here at BRAD FOOTE we have a happy combination of efficient machines and capable men to cut any size, any type, or any quantity of herringbone gears you might need.

• Then comes the finishing. Your specifications may call for heat-treating, flame or induction hardening, or perhaps shot-peening. All these and other special processes are available in BRAD FOOTE'S own shops. We control every operation on every gear, gearmotor, transmission, or assembly which you order from us. No one shares our responsibility.

• Close attention to details, complete manufacturing facilities, careful inspections, and strict adherence to specifications are your assurance of high quality in all BRAD FOOTE gears. So you can order with utmost confidence the gears you need for your own use or for resale on equipment you make for others.

• Next time you need gears, send us the specifications so we can quote you promptly.

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BIshop 2-1070 • OLympic 2-7700

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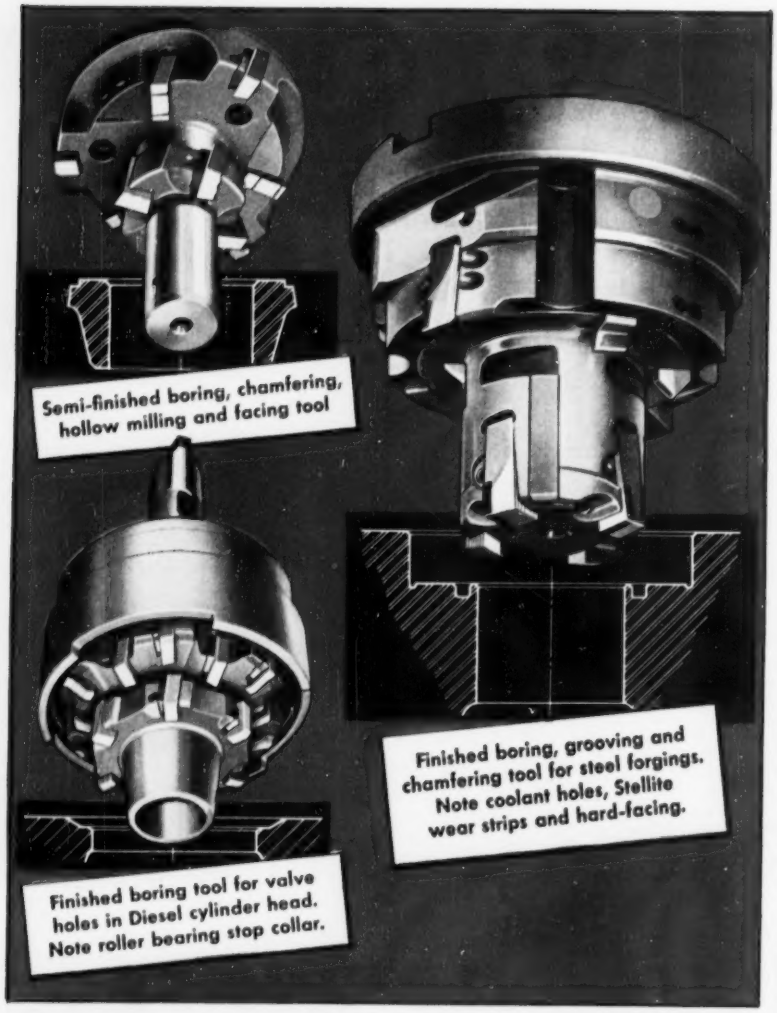
AMERICAN GEAR & MFG. CO. • Phone: Lemont 920 — Lemont, Illinois

PITTSBURGH GEAR COMPANY • Phone: ATlantic 1-9950 — Pittsburgh 22, Pennsylvania


Semi-finished boring, chamfering, hollow milling and facing tool
Finished boring, grooving and chamfering tool for steel forgings. Note coolant holes, Stellite wear strips and hard-facing.
Finished boring tool for valve holes in Diesel cylinder head. Note roller bearing stop collar.

TOOLING by GAIRING

These three examples of special tooling are picked from GAIRING'S engineering files to show typical instances of the work in which GAIRING has excelled for over 35 years • Regardless of your requirements, from stock counterbores to special tooling of the most complex nature, call on us • Ask us to have one of our representatives get in touch with you. These men, located throughout the country, are well qualified to discuss your tooling problems with you.

The GAIRING TOOL COMPANY • 21226 Hoover Road • Detroit 32, Michigan

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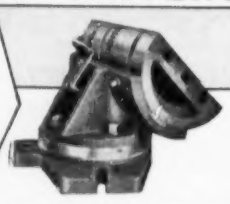
A Precision Tool that Holds Work at Any Desired Angle.



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With a Boston Universal Angle Plate on the job, work is quickly set up on the table and but a few seconds are required to locate it at the desired angle. Indispensable in tool rooms and extremely useful in production runs, the Boston Universal pays for itself many times over by eliminating the necessity of expensive jigs and fixtures.

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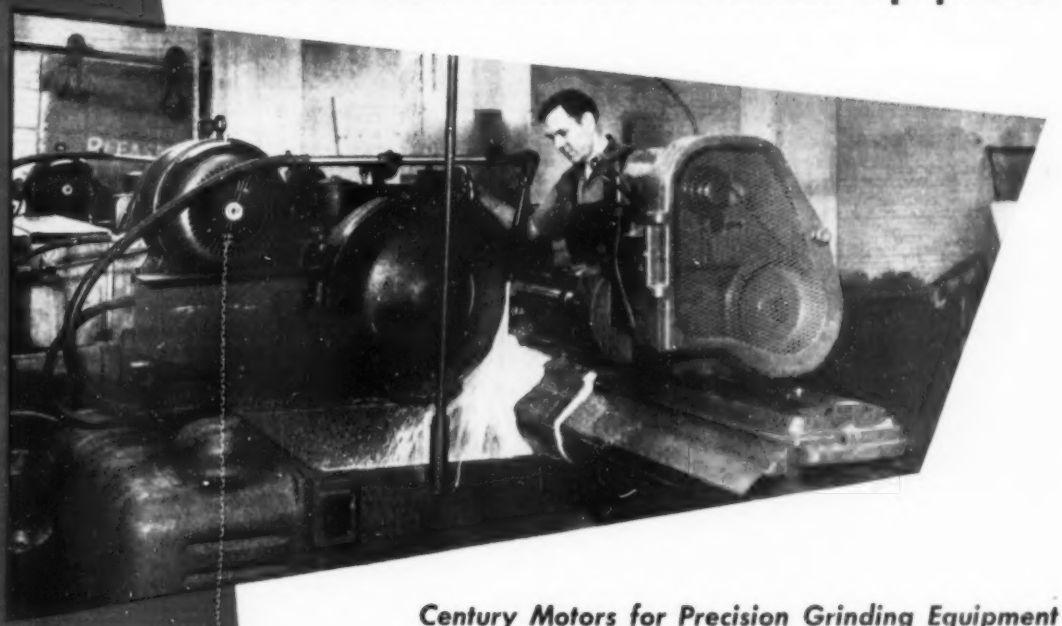

Century Totally Enclosed Fan Cooled Motor Driving a Grinder.

Century Motors for Precision Grinding Equipment

- Century Motors are unusually free from vibration—the business end of the grinder is not handicapped.
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- Century motors are styled and finished in standard machine tool color to match the fine equipment they drive.

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An IDLE man at a BUSY automatic spells PROFIT.
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¶ H&G Insert Chaser Die Heads are preferred by screw machine engineers because they spell less down time, lower costs, cleaner, more accurate threads.

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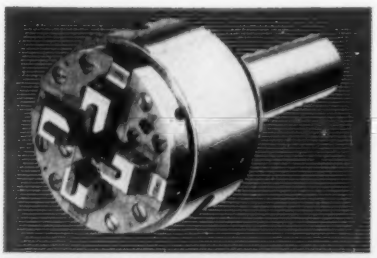
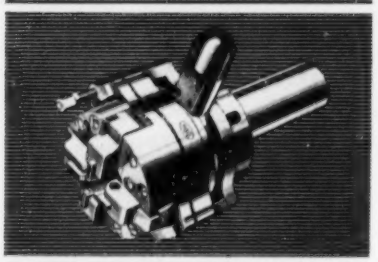
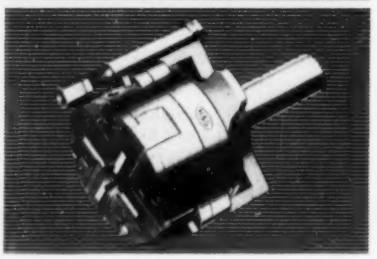
for multiple spindle automatics, chucking machines, drill presses.



Style DMS
for hand screw machines, turret lathes, where die head does not rotate.



Style DM
for B & S automatics and small spindle machines.



H&G Insert Chaser DIE HEADS

WRITE FOR "HOW TO SELECT THE PROPER DIE HEAD FOR THE JOB".

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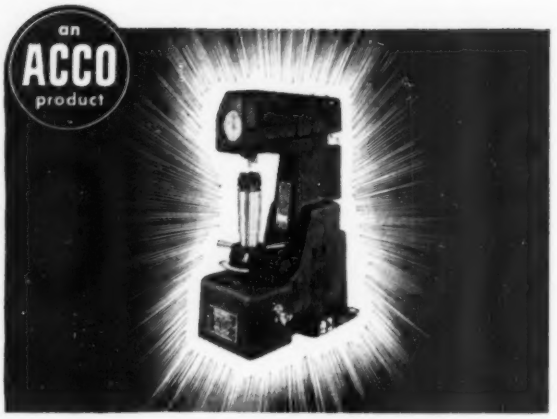

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is the production rate in **BROACHING**

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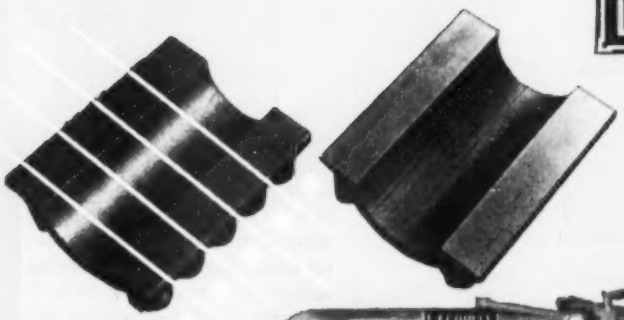
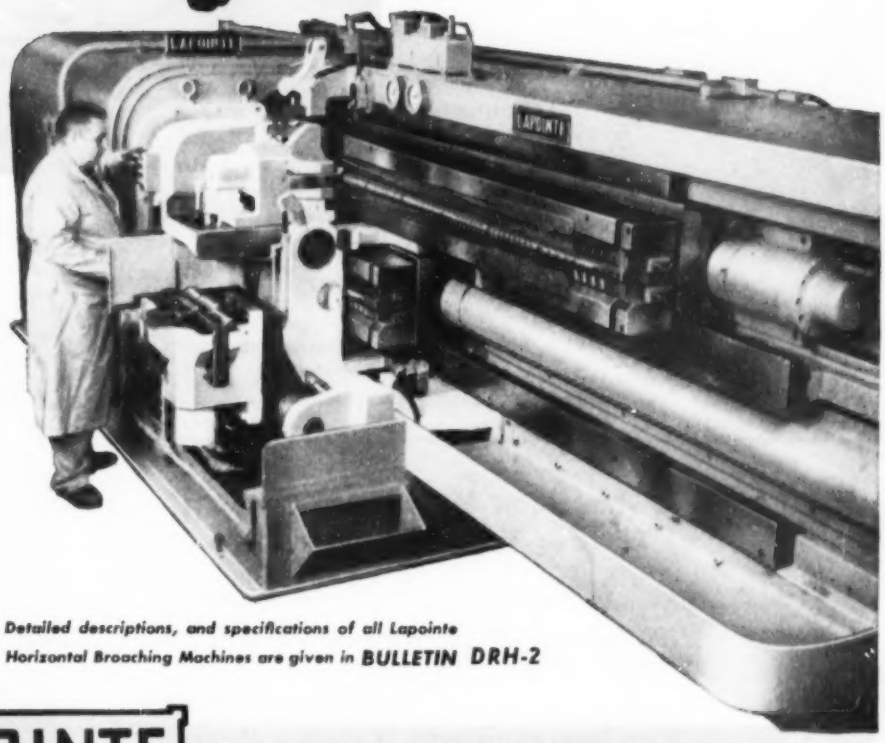
This high production is accomplished on the

LAPOINTE

Double Ram Horizontal Broaching Machine, 15-ton size, with 90-inch stroke *. . . using Carbide Broaches.*





Operating at 80 fpm cutting speed, these Main Bearing Caps are broached in clusters of 5, with the half-round, joint faces, and chamfered edges *all broached in one operation!*

SEND FOR FOLDER. *Detailed descriptions, and specifications of all Lapointe Horizontal Broaching Machines are given in* ***BULLETIN DRH-2***

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Drill Grinder with 3/8 inch capacity holder on left and 2½ inch on right side. Can also be furnished with a general purpose grinding wheel on left end instead of the small drill holder. Also available for wet grinding.

A POINT TO REMEMBER

A drill point that is sharp and correctly ground will—

(1) drill to exact size

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(4) require less power

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(6) cost less to regrind

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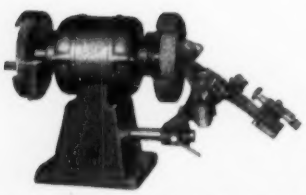
It naturally follows that a Drill Grinder will quickly pay for itself in increased production and lower cost direct and indirect labor.



Bench type Drill Grinder with 3/8 inch capacity holder. Also made in 1¼ inch capacity Pedestal type.

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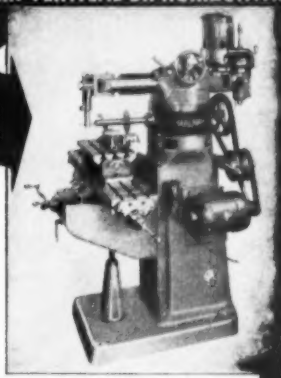

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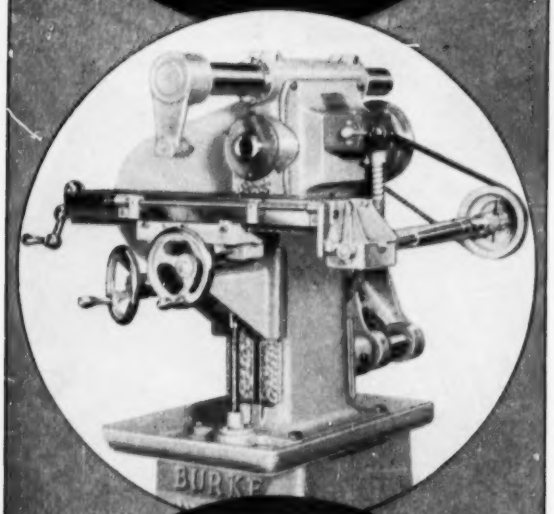

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Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

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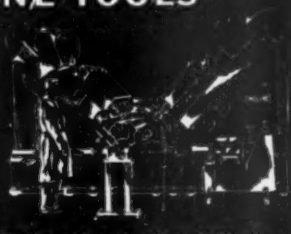

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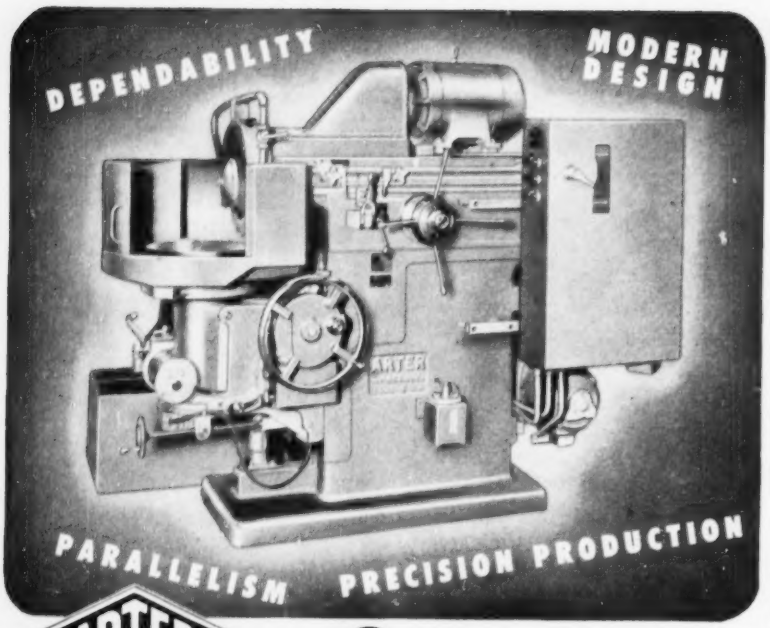

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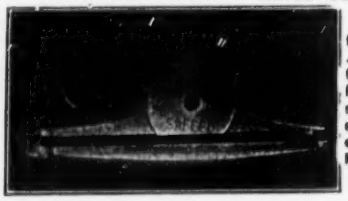

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• Versatile, as well as fast, the automatic lathe is capable of performing a large number of operations . . . turning, facing, chamfering, boring, and contouring.

How to Choose and Use AUTOMATIC LATHES

16 pages—25 cents

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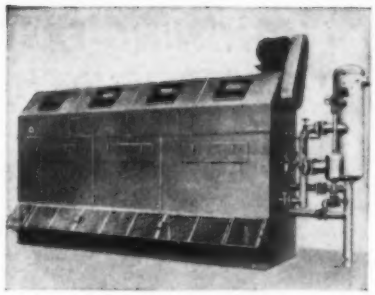

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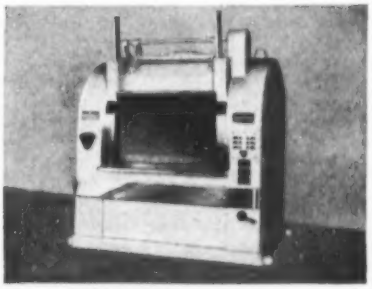

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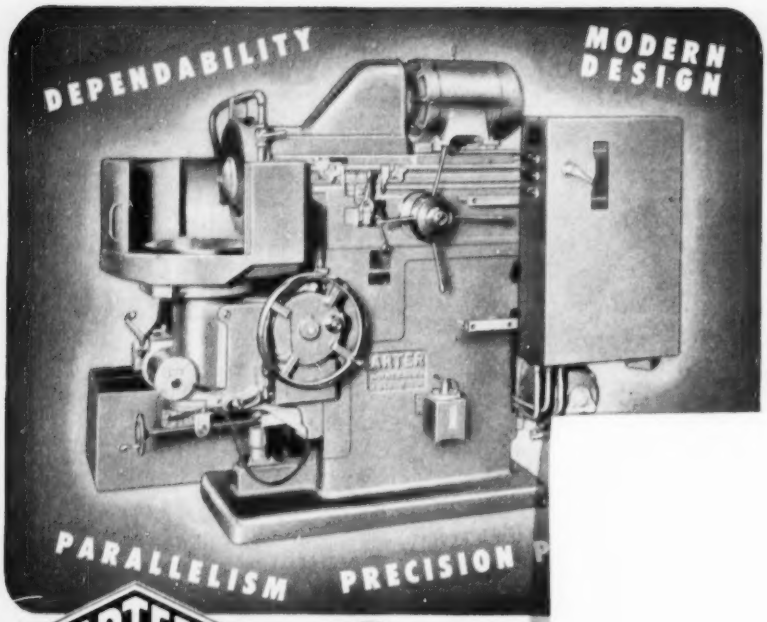

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Grinders for more than
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series, 12" and 16" in
city. They are modern in design, depend
give years of satisfactory service to all u
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Write today for
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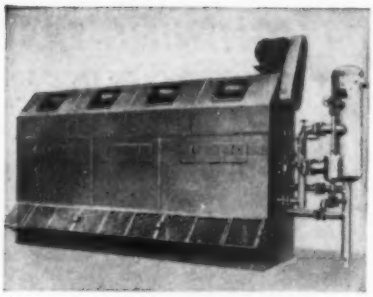

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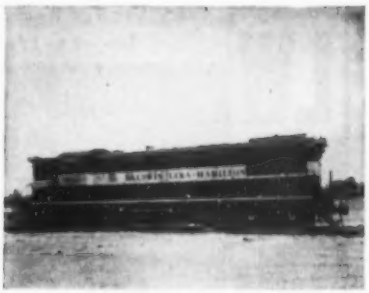

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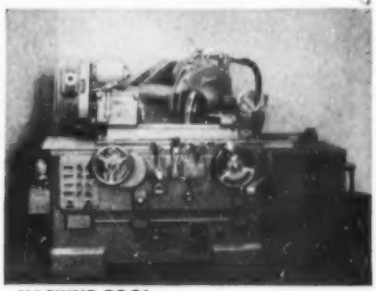

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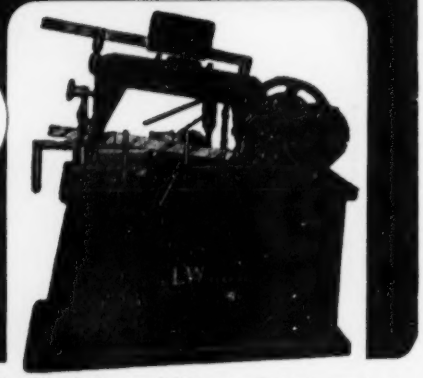

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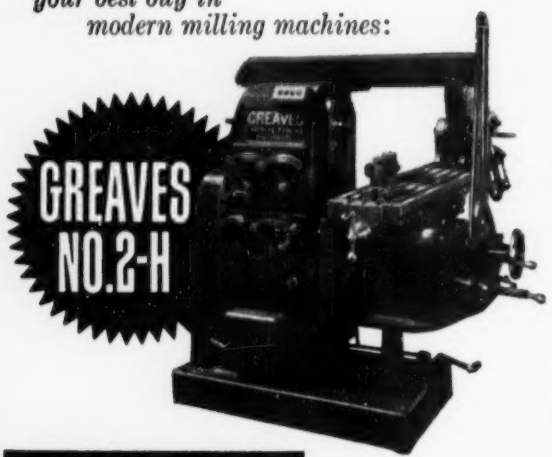

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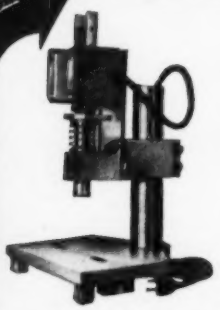

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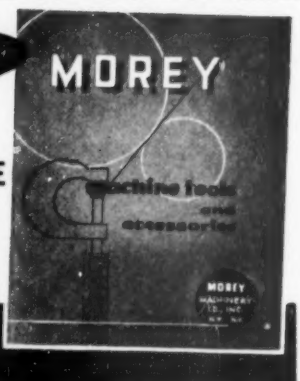

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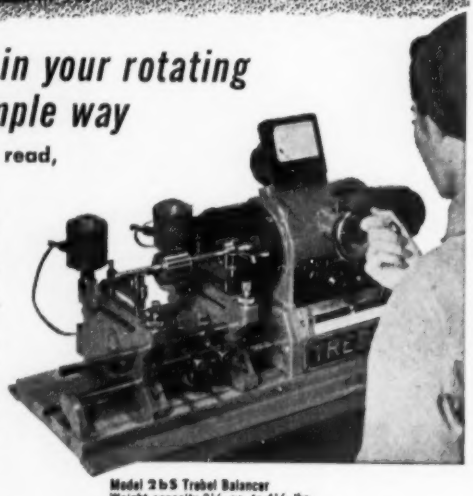

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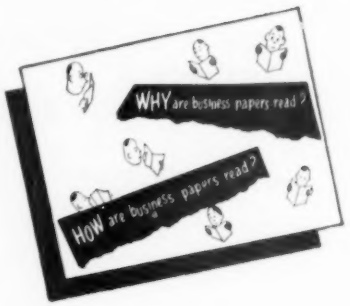

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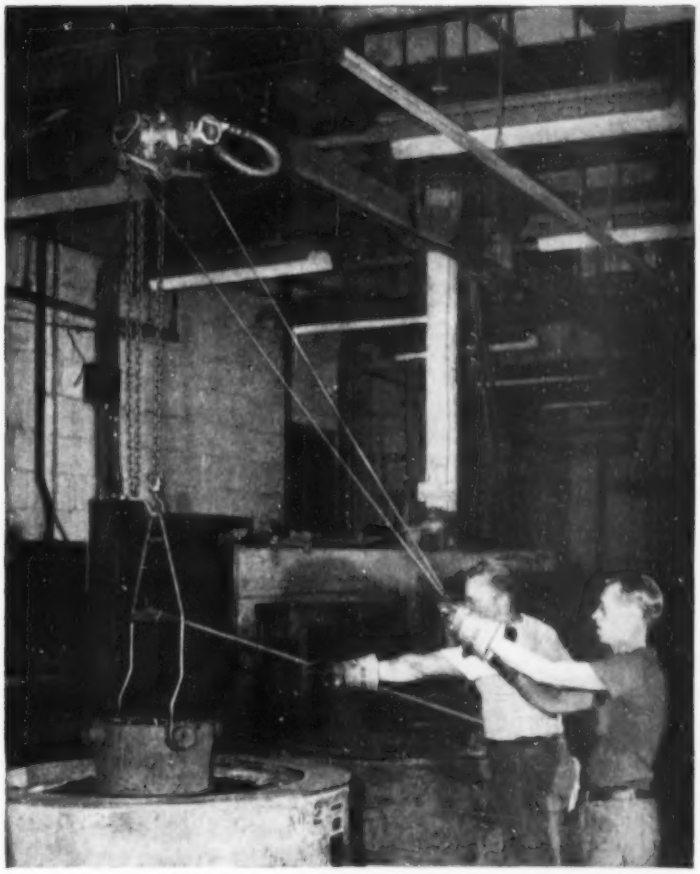

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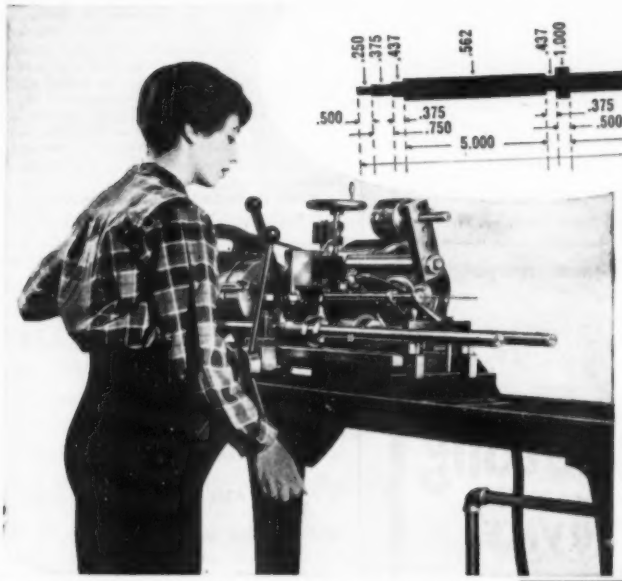

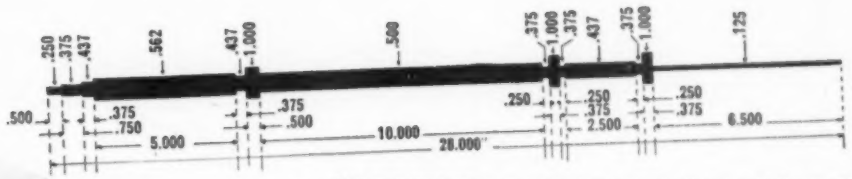

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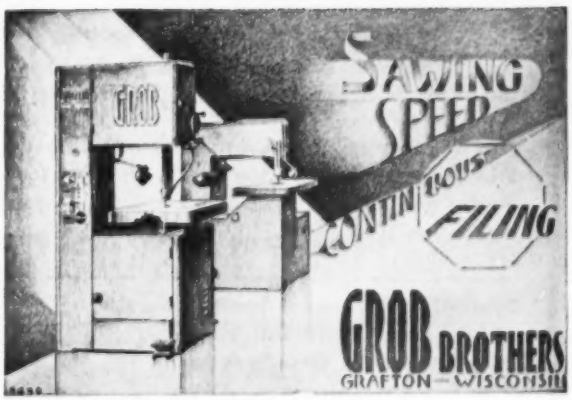

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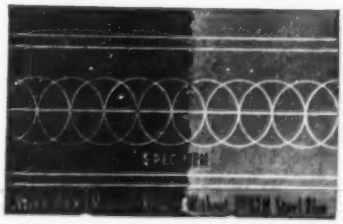

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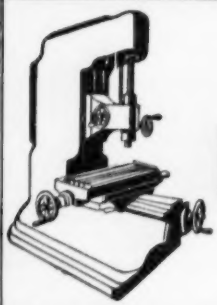

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BORING MILL, 2¼" Lucas Horiz., M.D.
BORING MILL, Lucas Horiz. 3" Bar, M.D.
BORING MILL, Giddings & L. #6 Horiz. 3½" Bar.
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DRILL, #121 Saker Auto., S.S. Cam Operated.
DRILL, Deep Hole, Avey-Ursulic #2, M.D.
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GRINDER, #4 U & L Univ. Tool & Cutter, M.D.
GRINDER, Disc, Mealy #295, 18" Dble. End.
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GRINDER, Cylindrical, Norton 10"x24", M.D.
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, #13 B. & S. Univ. Tool & Cutter.
GRINDER, Thread, Jones & Lamson #16-015. Late.
GRINDER, Heald #72A-5 Internal Size-Matic.
GRINDER, 14"x36" Pratt & Whitney Vert. Surf.
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GRINDER, Greenfield #12 Int. Hydromatic, M.D.
GRINDER, Oliver Auto. M.D. Drillpointer, #510.
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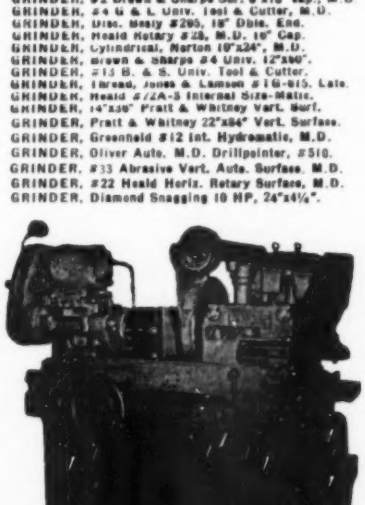

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GRINDER, 37" Wheel Dia. Osterholm Disc, 24" cap.
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GRINDER #79-72" Gardner Vert. Spindle, Late.
PROFILE GRINDER, Studer Type PSM, M.D., late.
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HAMMER, Bradley 200# Rubber Cushioned Helve.
HEADER, Manville #1 S.S.S.D. Cold 3/16".
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INDUCTION HEATER, 30 KW Lepel, Late Type
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KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
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LATHE, LeBlond 14"x8', Q.C.G. M.D.
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LATHE, American 16"x8' Q.C.G., Grd. Hd. M.D.
LATHE, Leiman 18"x7' Q.C.G., M.D.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, South Bend 18/28"x8' Gap Bed, Q.C.G. M.D.
LATHE, Hendey 20"x10' Q.C.G., Taper Att. M.D.
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LATHE, 42"x16' Pittsburgh Geared Head, M.D.
LATHE, Bulling Dble. End #VMTS, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret, #2 Bismeco Vari Drive 220 V.
LATHE, Turret #2 W & S Univ. Grd. Hd., Late,
LATHE, Turret, #4 Warner & Swasey Univ. 1½".
LATHE, Turret #4DE Potter & Johnston Auto., 1942.
LATHE, Turret #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
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LATHE, Turret, #3A Warner & Swasey Univ. M.D.
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MILL, #0-8 Cinci. Vert. Prod. Late, M.D.
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MILL, #2SP Van Norman Horiz. M.D., Late.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.

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MILLING MACHINE, LeBlond #4 Horiz. Univ.
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MILL, #5C Becker Vert. Die Sinker, M.D.
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THREAD MILL, 7½x11 Hanson-Whitney, Univ.
THREAD MILL, 6x14 Pratt & Whitney No. 1180.
THREAD MILLER, Lees-Bradner #40A Automatic.
THREAD MILLER, Pine-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.

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POWER PRESS, Bliss #3A O.B.S. Dble. Crank Grd. 45 tons, 8" stroke, 36"x28" Bed Area, M.D.
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PRESS, #7A Thomas O.B.I. 80 ton cap.
PRESS, #166 Toledo Toggle Drawing, M.D.
PRESS, 135 ton Clearing Single Crank 8" Str., Late.
PRESS, 70H Drake Hyd. Arbor, New.
PRESS, #78½ Bliss S.S. 9½ Str. M.D.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #1A, #19, #20, #21, USI, A.C., M.D.
PRESS, Waterbury-Farrel High Speed 60 tons #3W.
PRESS, 60 C Bliss Double Action, 8 crank.
PRESS, Lucas 15 tons Power Arbor, M.D.
PRESS, #90 Whitney Deep Thr. 24", feet.
PRESS, P2, P3 Ferracute M.D. Roll feed.
PANTOGRAPH, #1A Garton M.D. Engraving.
PUNCH, #4B Buffalo Forge Vert. Cap. 1 3/16" M.D
PUNCH, R-4 Wiedemann Turret, 10 Stat. 24" thr.
PUNCH, Hooker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End. 24" Thr. 1" thru 1".
PUNCH, H & J #4, 48" thr., with Shear Blades.

RIVET SETTER, ⅜" cap. Pens. Tubular Rivet.
ROLLS, Bertsch Pyramid 16"x1⅜" cap., M.D., Late.
ROLLS, #1 Buffalo Forge Wrapping, M.D.
ROLLS, 72"x¼" Lown Initial M.D., New.
ROLLS, #2 Buffalo Forge Vert. Angle, Bending, New.

COLD SAW, Wagner 10"x10" cap., M.D.
COLD SAW, Espen-Lucas #700, 45° dia. blade, M.D.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #4B Marvel Hack Saw 6"x6" Cap., M.D.
SAW, #20-C Rasine Shear Cut 6"x8" cap., M.D.
SAW, Band, Tannewitz GH-36" High Speed, M.D.
SAW, V-26 DeAll Contour Band, Late.
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SHAPER, 20" Rockford Univ. M.D., Tilting Table.
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SHAPER, 32" Cinci. B.G., Motor driven, H.D.
SHAPER, Morton 36" Draw-Cut, 4-Speed, M.D.
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SHEAR, #26 Buffalo Forge Slitting Armor Plate.
SHEAR, Quickwork #11 Rotary 60" Throat, 10 ga.
SHEAR, 10' x 10 ga. Wysong & Miles, M.D., New.
SCREW SLOTTER, #2 Waterbury Farrel Auto. M.D.
SLOTTER, 12" New Haven Vertical, M.D.
SPRU CUTTER, Milwaukee 50 tons, 3½ cap. M.D.
SURFACE PLATES & TABLES, all sizes.

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TAPPER, #1 Bakewell (Warner & Swasey) Late.
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TRUCK, 4000 lbs. LT-44 Towmotor Fork Lift 9'.
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WELDER, 200 KVA Federal, Projection.
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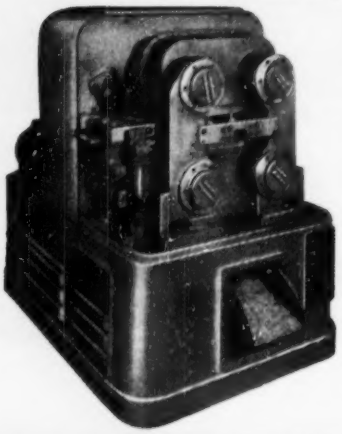

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Send for a descriptive catalog covering machine.

RECENT ADDITIONS TO STOCK

BORING MILLS

Bullard 34" New Era Vert. Turret
Gisholt 72" M.D.—2 Hd. Vertical
Gidding & Lewis #90T Horiz. Table type, 2000 RPM spindle speed
Cinn. 10' M.D. 2 Hd. Vertical

GRINDERS

Cinn. No. 4 Centerless, Thru-feed
Blanchard #16A Vertical Surface
Norton 10"x36", 10"x50", 14"x96" Plain
Landis 16"x18" Hyd. M.D. Plain C

MILLERS

Rowbottom up to 32" M.D. Cam Miller
Van Norman 22LU M.D. Univ. Duplex
Potter & Johnson 2M Horiz. Auto.
Farrell Birmingham 4 post—300 ton, Hyd. Sheridan 125 ton—4 post, M.D. Dieing.

PRESSES

Henry & Wright 50 ton M.D. Dieing
Bliss No. 1½ D.A. Toggle
Clearing Model DS-1500-60, 500 Ton Double Action Press, 1942 Machine
Cleveland 400 Ton #4K Knuckle Joint

TURRET LATHES

Bardons and Oliver #2-1" Elect. Geared
Gisholt No. 4 Turret Lathe
Potter & Johnson #4D-21" M.D., H.S.
Gisholt No. 5 M.D. Ram Type Univ.

MISCELLANEOUS

Barber-Colman Type A Gear Hobber, Polychoke 1" cap., M.D., Cut-Off Mach.
Fellows #72 M.D. High Speed Gear Shaper
Barrett #1200 Fixed Bowl Centrifugal Separator
Dreis-Krump, 10 ft. 10 ga. Gap Sq. Shear
Ajax 1½" and Acme 3" Upsetters

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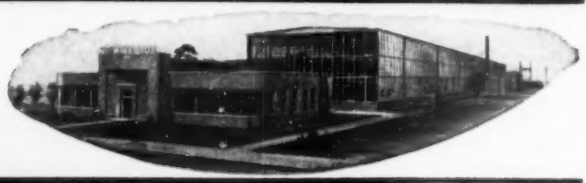

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AUTOMATICS

3½" RA-4 Acme Gridley. 1940
2" Model A Cleveland. 1941
1¾" Model A Cleveland. 1943
1-1/16" Model A Cleveland. 1943
No. 00G Brown & Sharpe. 1941

BOREMATICS

No. 48 Heald Single End. 1941

BROACHES

HP-100 La Pointe Horiz. Broach. 1943
5 Ton 36" Stroke La Pointe Vertical. 1942

DRILLS

No. C225H Natco Multi. Spdl. 1942
Ma-6 Avey 6 spindle, H.F. 1943.
Allen Single Spindle Drill & Tapper. 1942
No. 2 LMo Leland-Gifford. H.F. 1942

GEAR EQUIPMENT

No. 7 Gleason "Hevea" Rougher. 1943
No. 6 Gleason Revacycle Generator. 1940
No. 72 Fellows H.S. Gear Shaper. 1942
10" Pratt & Whitney Hyd. Gear Grinder. '42

GRINDERS, CYLINDRICAL

14"x168" Norton Plain Type "C". 1942
12"x96" Fitchburg Plain Hyd. 1942
12"x48" Cincinnati Univ. Grinder. 1942
10"x18" Norton Plain Type "C". 1940
6"x30" No. 12 B&S Hydraulic. 1940
No. 5 Brown & Sharpe Plain. 1941
No. 2 Cincinnati Centerless Grinder. 1944

GRINDERS, INTERNAL

No. 72-A3 Heald Plain Hydraulic. 1942
No. 24-36 Bryant Hydraulic. 1943
No. 16 CP 16 Bryant Hydraulic. 1942
No. 10-16 Bryant Hydraulic. 1942
No. 172 Heald Hydraulic. Gap. 1940
No. 112 Rivett Universal Internal. 1940

GRINDERS, MISCELLANEOUS

Cincinnati Centerless Lapper. 1942.
No. 600 UK Hanchett Face Grinder. 1946
No. 35 Excello Univ. Thread. 1940.
HRS Barber-Colman. 1942.

GUN BARREL MACHINES

No. ½ B x 50 P & W Reamer. Latest
No. ½ B x 30 P & W Reamer. Latest.
No. ½ B x 50 P & W Rifler. Latest.

LATHES, ENGINE

58"x296" American Geared Head, M.D.
27"x192" Niles Timesaver, 2 Carr. 1941
42"x132" Monarch Auto. Sizing. 1942.
27"x96" Niles Timesaver. 1940
26"x180" Betts Bridgeford. 1940
48"x96" Betts Bridgeford. 1940
10"x20" EE Monarch Toolmakers. 1943

LATHES, PRODUCTION

No. 5D Potter & Johnston Automatic. 1943
6"x84" Lo-Swing Semi-automatic. 1941
Lips Carbo-Matic Lathe. 1942

LATHES, TURRET

No. 1A Warner & Swasey Saddle Type. 1941
No. 1L Gisholt Universal Saddle Type. 1942
No. 3R Gisholt Universal Saddle Type. 1943
No. H5 Libby Universal Saddle Type. 1939
No. 5 Gisholt Universal Ram Type. 1942
No. 6R Denver Universal Ram Type. 1942

MILLS, PRODUCTION

M-18 Milwaukee. 1943
No. 1224 Milwaukee Simplex. 1943
No. 0B Cincinnati Vertical. 1943

MILLS, TOOL ROOM

No. 3 Cincinnati Vertical, M.S. D.T. 1940
No. 3 Van Norman Plain. 1942
No. 2 MI Cincinnati Plain. 1951
No. 21 Van Norman Plain. 1942

SHAPERS

16" Garnetti Universal Shaper. New
20" Garnetti Universal Shaper. New
16" Brock Universal Shaper. New.
24" Garnetti Universal Shaper. New

PRESSES

800 Ton Verson Dbl. Act. Eccentric. 1940
No. 100 Toledo Toggle Press.

Partial Listing — Write for latest stock list

INDIANAPOLIS *Machinery & Supply Co.*
1961 S. Meridian St. . . Indianapolis, Indiana

MODERN MACHINES

#9A Jones & Lamson Turret Lathe—new 1941 Serial #65107—Rebuilt and guaranteed
Heald #25A Rotary Surface Grinder—Serial #4577 Reconditioned and guaranteed
3'9" Column Cincinnati Bickford Radial Drill Serial #2A-41—new 1936—Rebuilt & guaranteed
72" Rebuilt King Heavy Duty Vertical Boring and Turning Mill—Serial Lot 38-#175
4½" Bar Giddings & Lewis #45 Table Type Horizontal Boring, Drilling and Milling Machine—Serial #8150.
Ingersoll Adjustable Rail Planer Type Milling Machine—Serial #3158—Reconditioned and guaranteed
#64 Fellows Gear Shaper Ser. #26113
#64A Fellows Gear Shaper—Ser. #25634
Rebuilt 6' 15" Column American Triple Purpose Radial Drill—Serial #55592.
60" Hanchett Face Grinder—Reconditioned and Guaranteed.
6D Potter & Johnston Automatic Chucking Machine Serial #70393
16" Gould & Eberhardt Shaper—Ser. #66737

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61-A Purchased New in 1943

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With cut-off slide and turret, completely rebuilt.

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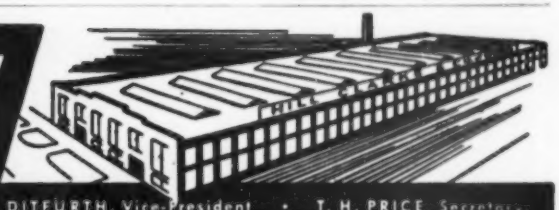

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AUTOMATICS

1-1/16" Model A Cleveland (1942)

DRILLS

1 Spdl—15" Sw—No. 2 Avey, Cam Fd.
1—Spdl—24" Sw—No. 2 MA6 Avey
2 Spdl—24/ Sw—No. 3 Avey
D-31 Fox Multiple Dril, No. 2 Taper
6' Western Radial

GEAR MACHINES

No. 12HS Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper
No. 36-BM G & E 3 Spdl, Roughe
No. 612-A Fellows Gear Shaper
No. 615-A Fellows Gear Shaper
No. 65 Fellows—Cone Dr.
8" cap Red Ring Gear Lapper

LATHES

12"x21" Fay Automatic
16"x33" R-14 Seneca Falls Auto-Lathe
13¼"x39" Centers Dimco Lathe (New)
15"x39" Centers Dimco Lathe (New)
18"x59" Centers Dimco Lathe (New)
23"x60" Centers Dimco Lathe (New)
24"x39" Centers Dimco Lathe (New)
19"x8' LeBlond Hvy. Duty Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4 Warner & Swasey Tur.-Bar Fd.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 3AL Gisholt
No. 3AL Gisholt Cross-Slide Tur.
No. 4A Warner & Swasey—7⅛" Hole—Spdl.

GRINDERS

66"x18" Norton Cylindrical (1943)
Hill-Clarke Norton Type Motor Driven Grinders

10"x36" centers
10"x50" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
20"x96" centers
24"x32" Gap x 144" centers

No. A-3—12" Arter Rotary Surf.
No. 22—12" Heald Rot. Gdr. (1944)
5B Bryant Internal Grd.
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

MILLING MACHINES

54"x30"x16' Ingersoll Slab Mill
4"x9" Hanson-Whitney Thrd.
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)
12"x102" Lees Bradner Thrd. Mill

PLANERS

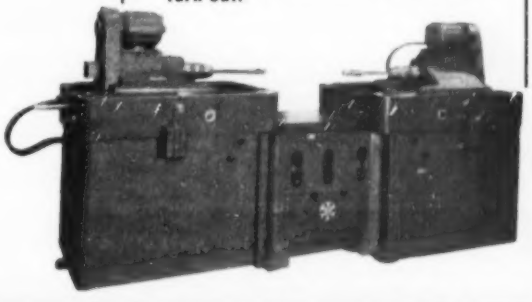
36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 hds.
42"x42"x10' Cincinnati, 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati, 2 hds.
48"x48"x12' Gray Maxi-Service
60"x48"x27' American, 4 hds.

MISCELLANEOUS

1"-2" Dia. Cap. Micro. Hor. Hone—#200
¼"-1" Dia. Cap. Micro. Hor. Hone—#H-2
42"—18 gage Economy Power Shear
75 Ton R & K Straight Side Press
3 Ton Fox Hydraulic Press
2—12"x96" Magnetic Chucks
20'x1" cap Southwark Roll
14'x⅝" cap Niles-B-Pond Roll
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
No. 0 Bakewell Tapper

Attention!

Model 200 H-5 Double End Micromatic Hone. See this machine in our plant, tested under power. Know what dependable work it can turn out.



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BORING MILLS

24" Bullard Spiral Drive Vertical Turret Lathe—1942

42" Bullard New Era Vertical Turret Lathe

100" Betts Heavy Duty Vertical Boring & Turning Mill

GRINDERS

6"x18" Landis Type C Plain Cylindrical—Plunge Cut—Automatic Cycling

6"x30" Norton Semi-Automatic Plain Cylindrical—Hydraulic Rapid Infeed, reciprocating spindle

10"x36" Landis Type C Plain Hydraulic Cylindrical—1941

14"x36" Norton Type C Cylindrical—Hydraulic Plunge—1943

#81 Heald Plain Chuck Type Internal—1941

#73 Heald Airplane Cylinder & Sleeve—1944

12"x36" Norton Type "L" Universal—1941

#186—30" Garaner Horizontal Disc—1941

#24—53" Gardner Horizontal Disc—1939

#95—110" Bridgeport Face Grinder—1943

LATHES

12"x30" Model C Monarch Geared Head Tool Room—1940

14"x30" Reed Prentice Sliding Gear Head Engine—1939

16"x48" Bradford Geared Head Quick Change—1940

16"x78" Model W Monarch

#1 Lodge & Shipley Duomatic—1938

MILLERS

#10 Brown & Sharpe Plain—1941

#4K Kearney & Trecker Plain—1942

18" Cincinnati Manufacturing Type—1941

#2H—24" Milwaukee Manufacturing Type—1940

#1218—Milwaukee Simplex—1941

#1854—Milwaukee Duplex—1942

#FV5MZ—Skoda Vertical—31" x 91⅜" Table—1942

36"x36"x16' Ingersoll Three-Head Adjustable Rail Planer Type

PRESSES

#59 Niagara Single Crank, Single Geared Straight Side Tie Rod, Bed 31" x 27", stroke 3"

200 ton HPM Fastraverse, 18" stroke, bed 48"x48"—1944

TURRET LATHES

#3 Gisholt Universal—Preselector Head—bar feed—1941

#4 Gisholt Universal—Preselector Head—Bar Feed—1940

#1L Gisholt Universal—Saddle Type—1942

#2L Gisholt Universal—Saddle Type—1941

#1 Warner & Swasey Electric Head—1944

#1A Warner & Swasey Saddle Type—1939

#1FU Fastermatic Universal Automatic—1943

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Capacity	1"	3/8"
Depth of throat	48"	48"

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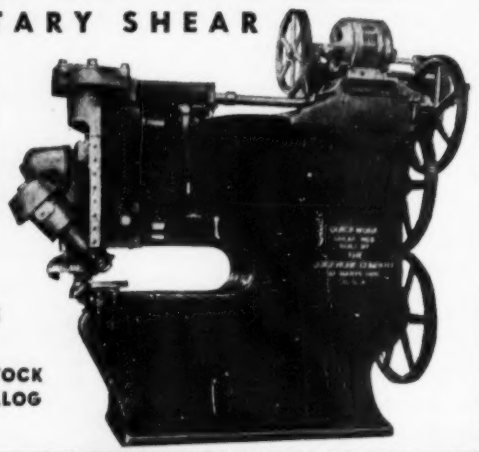

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Landis 20"x72" and 18"x96" Plain Ext. Grinders.
Hanchett 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x48" table.
W & S No. 2-A Grd. Hd. Univ. Turret Lathe chucking.
Rivett No. 104 A.C. M.D. Internal Grinder.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers D.O.
Cincinnati 36"x36"x10' D.H. Planer 2 Hds. Box Table.
Heald No. 72A-3 Hydr. Int. Grinder Red Head Sp.
LeBlond 27"x12' Std Grd. Hd. Q.C.G. Lathe 13" hollow spindle.
Norton 6x18" Horiz. Hand Surf. Grinder 1941.
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
G & L 3" Bar Horiz. Boring Mill.
20" All Grd. Camel Back Drill 1-Sp. and Barnes.
Amer. 3' & Morris 3½' Arm Radial Drills.
Blanchard M.D. Vert. Sp. Surf Grinder 26" chuck.
Campbell No. 213 abrasive cut off 1947.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Rot. Surf. Grinder 12" chuck 1947.
Nazel #3-B Vert. Air Hammer A.C. M.D.
Landis 2-Sp. 2" Cap. Bolt Threader M.D.
Hendey 16"x8' bed Q.C.G. Lathe 1939.
W & S No. 4 Ram Type Grd. Hd. Turret Lathe.
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 48" Table 1-Sp. Cont. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kempsmith No. 2 Vertical Maximiller M.D.
Heald #70-A Red Head Sp. Internal Grinder.
Springfield Planer Type Surf. Grinder.
P & J #2 Auto. Prod. Miller. 2 Tables.
Foste-Burt #25 Box. Col. 1-Sp. Hvy. Drill.
L & N, 8', 10' & 12' Press Brakes.
Bullard 24" & 30" Vert. Turret Lathes.
Lynd-Farquhar 26" stroke openside Shaper Planer.

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1531-35 No. B'way., St. Louis 6, Mo.

No. 2 B & S High Speed Automatics, M.D.
No. 25 Heald Rotary Surface Grinder.
30" P & W 2-spindle Vertical Profiler.
No. 45 Fellows Helical Gear Sharpener.

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Serial No. 55,230, 5' x 3½' Drill Bed, 22" x 27" Drill Table, No. 5 Morse Taper Drill Spindle, Feeds .008" to .056", 10 HP Motor on Arm, 19" Column. HEAVY DUTY DRILL.
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Layton, New Jersey

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CAM MILLERS

VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CENTERING MACHINES

SUNDSTRAND: 44" Double End Centering Machine

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang
PRATT & WHITNEY: ½B x 50 Deep Hole Reaming Machine
SUNDSTRAND: 44" Double End Centering Machine

GEAR CUTTING MACHINES

BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¾ D. P. capacity
CLEVELAND: Model 130 Gear Hobber (like new)
CLEVELAND: Model 140 Gear Hobber (like new)
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

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PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x 24" Hydr. Spur Gears and Splines

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 4 and No. 6 Bevel Gear Testers. Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, Plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
NORTON: 10"x18" 45° angle wheel

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1. Should any machinery purchased from us prove unsatisfactory, you can return the machines within 30 days, via freight prepaid to our plant, and a full refund will be made.
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GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL

BRYANT: No. 5Y Internal
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #639, capacity 7"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18"
JONES & LAMSON: #636 Universal, 6" dia. x 36" centers and one extra multiform wheel dressing attachment

HONING MACHINES

MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia.

JIG BORING MACHINES

LINDNER #14 & #15 Jig Borers, new

LAPPING MACHINES

FELLOWS: 8LSI and 13 LSI Gear Lappers, external and internal spur and helical

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BLOUNT: Polishing speed lathe 12" dia. x 48" centers
H.E.B.: High production hydraulic duplicating and copying lathes (new)
LODGE & SHIPLEY: #3A Duomatic. 25½" swing x 27" centers
POTTER & JOHNSTON: #6 DREL Automatic
PROGRESS: Geared head 16" to 30" swing (New)
New Engine Lathe 49" swing x 20' centers
New Engine Lathe 27" swing x 23' centers

LATHES—TURRET

WARNER & SWASEY 2A Turret Lathe
WARNER & SWASEY #3 Turret Lathe
HERBERT: #2, #4, #7, and #8 Sizes (new)
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES

TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: 40A Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

WIRE FORMING MACHINES

BAIRD: 4-slide wire former
HEENAN & FROUDE: Wire forming, 4-slide machines (new)

MISCELLANEOUS

CUTOFF: Campbell, abrasive 425 Cutalator 4½" dia. Capacity
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
GOGAN BRINELL Hardness Tester Model 16 J
SHAPERS: Klopp 16 to 26½" (New)
SHAPERS: Hercules 16" & 22" (New)
SUNDSTRAND: 44" Double End Centering Machine
WIRE FORMING MACHINES: 4-slides (new)

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24"x84" centers **BOYE & EMMES** Heavy Duty Geared Head Engine Lathe, chuck, AC-MD.

25"/32"x96" centers AMERICAN Pacemaker Heavy Duty Engine Lathe, taper attachment, chucks, 25 HP AC motor, new 1948.

28"x15' centers **BERTRAM** (Niles patterns) "Timesaver" Engine Lathe, 2 carriages, rapid traverse, AC-MD, new 1943.

60"x20' **NILES BEMENT POND** Geared Head Engine Lathe, rapid traverse.

No. 3L **GISHOLT** Turret Lathe, 5-1/16" hole thru spindle, new 1943.

No. 5 **GISHOLT** Universal Turret Lathe, preselector head, bar & chuck, new 1943.

42" BULLARD Spiral Drive Vertical Turret Lathe, Serial 23800, New 1944.

No. 3-24 **CINCINNATI** Plain Hydromatic Mill, AC-MD

No. 4 **KEARNEY & TRECKER** Plain Horizontal Mill, No. 50 taper, motor in base, rapid traverse.

#4H **KEARNEY & TRECKER** Vertical Mill New 1944, with dividing head, rotary table, collets, vises, measuring rods, dial indicators.

5'-13" column **CARLTON** Radial Drill, AC motor in arm, 15-1500 RPM, box table.

25A **HEALD** Rotary Surface Grinder, 24" diameter magnetic chuck, AC-MD.

14"x36" **LANDIS** Universal Hydraulic Cylindrical Grinder, new 1943.

36" **OHIO** Dreadnaught Shaper, AC-MD.

1½" **LANDIS** Bolt Threader, leadscrews, AC-MD.

75 Ton **HENRY & WRIGHT** Double Crank Dieing Machine, roll feed & scrap cutter.

No. 135 **CLEVELAND** Rigidhobber.

1⅜" **CLEVELAND** Model "A" Automatic Screw Machine, new 1942.

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AIR COMPRESSOR, 64 C.F. I-R Model ER-1, Late
AUTOMATIC, 1¾" 4 spin. Gridley Model G
BOLT THREADER, 1½" Williams Reliance
BORING MILL, 100" N.B.P., 2 Hds., M.D.
BORING MILL, 100" Cinci. Massive, 2 Hds., M.D.
BORING MILL, 72" King, 2 Hds., P.R.T., M.D.
BORING MILL, 72" N.B.P., 2 Hds., P.R.T., M.D.
BORING MILL, 48" Colburn, 2 Hds., M.D.
BORING MILL, 4½" Bar Niles, Table Type
BORING MILL, 3½" bar Giddings & Lewis #6
BORING MILL, 3¼" Bar Binsse, Knee Type, M.D.
BORING MILL, 3" bar Lucas, Table Type
DRILLS, RADIAL, 4' Western, M.D. (2)
6' Amer. 15" col. Trip. Purp., M-on-Arm
5' Amer., 15" col. Trip. Purp., M-on-Arm
5' Amer., 14" col., Trip. Purp.
5' Niles #10 Rightline, Univ., Motor-on-arm
4' Amer., 13" col. M-on-Arm
3'8" & 2½' Arboga (Swedish), Late
TABLES, RADIAL, 36"x20"x20"
DRILLS, #8D Colburn 36", 5" capty
#314 Baker, 24", 2" capty.
24" Cinci. Brick., Tapping, M.D.
#2LMS Leland Gifford, Deep Hole
DRILL, MULTI, 32 spin. W-7 Baush, 1947
FLANGERS, ¾" and ½" McCabe (2)
GEAR CUTTERS, No. 13 B. & S. Spur & Bevel
GEAR SHAPERS, Nos. 61A, 64, 64A & 75 Fellows
GRINDER, SURFACE, 12" Heald No. 22
GRINDER, SURFACE, 14"x36" P. & W
GRINDERS, SURFACE, No. 33 Abrasive, Vert. Spin.
GRINDER, 4"x18" Landis #4H, Cylindrical, Late
GRINDER, No. 6T Sellers Tool, 1942
GRINDER, Micro Internal, large capty.
GRINDER, 18"x144" Norton Cyl., M.D.
HAMMER, 1000 lb. Chambersburg Pneumatic, 1947
KEYSEATER, No. 3½ Baker, 24" str. x 4" wide
LATHES, 48"x20' cen. N.B.P., M.D.
42"x28' bed L. & S., T.A., M.D.
48"x20' bed, Amer. T.A., Grd. Hd.
32"x14' bed Schumacher Boye T.A., M.D.
28"/48"x16' bed Hahn Larmon, Gap
26/48"x18' McCabe, Dble. Spin
26"x12' Bridgeford, QCG Grd. Hd., M.D. (2)
24"x12' bed B. & E., T.A., Grd. Hd.
24"x8' Bed Amer., T.A., M.D.
20"x78" Matra, T.A., New
20"x10' bed Amer. Grd. Hd. M.D.
20"x10' bed L. & S., T.A., M-in-Base
18"x10' bed L. & S., T.A., Cone Motorized
18"x8' bel L. & S. Selective Grd. Hd., M.D.
16"x60" cen. P. & W. Motor-in-Base
16"x32"x8' Harrington Gap M.D.
16"x6' & 12"x6' Hendeys (2)
14"x6' bed Amer. T.A., M-in-Base
10"x56" bed Sheldon, New 1946
No. 3x42" Hendey Turning (1200 r.p.m.)
TURRET LATHES, No. 3AL Gisholt, 6¼" H.S.
No. 3 Gisholt, 1942
No. 2B Foster Univ., 3¼" Capty., Bar Timken
No. 1B Foster Univ., 2" capty. M.D.
21" Acme Universal Brass, Late
18" Libby Model A Grd. Hd.
MILLER, No. 3 Cinci. Hi Power, Motorized
MILLERS, Nos. 2 & 3 Cinci. Hi Power Univ., M.D.
MILLER, No. 2 Stand. K. & T. Univ. #50
MILLER, No. 2 Van Norman Ram, M.D.
MILLERS, No. 2 Abene (like Van Norman) New
MILLER, No. 1½ B K. & T. Univ., Grd. Hd.
MILLER, No. 000 B. & S. Plain, M.D., Late
MILLER, No. 0 Sundstrand Rigidmil, Hand
THREAD MILLER, 12"x60" Morey Shields, '42
PLANER, 36"x36"x10' Cinci., 4 Hds.
PRESS, 73½ Bliss S.S., 6" stroke
PRESS, No. 55 Toledo S.S., Grd., 171 ton capty.
PRESS, #3C Bliss 30", "Stiles", Late
SHAPERS, 32", 28", 20", 16" Gould & Eberhardt
SQUARING SHEAR, 8'x3/16" Geo. Ohl

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20"x10' **LODGE & SHIPLEY** Selective Geared Head
30"x16' bed **AMERICAN** High Duty Geared Head
42"x15' **AMERICAN** Heavy Duty Lathe
42"x25' centers **AMERICAN** Heavy Duty Lathe

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No. 172 **HEALD** Gap Internal Grinding Machine for large swing
6"x18" **LANDIS** Type C Plain Grinder
6"x18" **NORTON** Vertical Spindle Surface Grinder
10"x24" **LANDIS** Universal Grinder
10"x72" **LANDIS** Type C Hyd. Pl. Grinder—1942
No. 104 **RIVETT** Internal Grinder
No. 172 **HEALD** Internal Grinder

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No. 2 **B&S** Wire Feed Hand Screw Machine
No. 2 **B&O** Geared Elec. Turret Lathe
No. 1L **GISHOLT** Saddle Type Turret Lathe, 1942
Nos. 4D & 6S **P&J** Auto. Lathes

MILLERS

No. 0-8 **CINCINNATI** Plain Milling Machines
No. 0-8 **CINCINATI** (Model 0T) Vert. Milling Machine
No. 1-8 **KENT OWENS** M.D. Production Miller
No. 1-14 **KENT OWENS** M.D. Production Miller
No. 1-18 **CINCINNATI** Plain Mfg. Miller
Model MM-5 U.S. Multi-Miller
No. 2M **CINCINNATI** Vertical Miller, 1941
18" **CINCINNATI** Mfg. Knee Type Milling Machines
No. 36 **VAN NORMAN** Plain Ram Type Miller
4½x36" **P&W** Model C Thread Miller
6"x60" **P&W** Model C Thread Miller
36"x36"x16' **INGERSOLL** Planer Type Milling Machine—3 heads
36"x36"x12' **INGERSOLL** Planer Type Milling Machine—3 heads—late

GEAR EQUIPMENT

Type A **BARBER-COLMAN** Gear Hobber
No. 64 **FELLOWS** Gear Shaper
No. 72 **FELLOWS** High Speed Gear Shaper
No. 725A **FELLOWS** High Speed Gear Shaper
No. 12 **FELLOWS** Gear Shaver, 1943
No. 36BM **GOULD & EBERHARDT** Gear Rougher

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No. 0 **GIDDINGS & LEWIS** Horizontal Boring, Drilling & Milling Machine
No. 32 **LUCAS** Horizontal Boring, Drilling and Milling Machine
100" **BETTS** Vertical Boring Mill, 2 heads

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Bullard 24" V.T.L., Spiral Drive
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Buffalo #2 Motor Spindle, No. 16 4 Spindle
Buffalo: Power No. 41, No. 42
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Cincinnati Bickford 6'x15" col.
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24" Sibley Sliding head
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T.M.A.—G2 2 Dim.

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Barber-Colman Mod. SHS. Sharpener
Barber-Colman #2, #12 (3)
Browne & Sharpe Hobber Type S
Browne & Sharpe #3 Gear Mill, 26" Cap.
Fellows High Speed Shapers 712, 725, 71, 7
Fellows #20M Redliner, Flather 72" Cutter
Gleason #2 Surface Hardener, No. 3 Gear Tester
Gleason #3 Spiral, #3 Straight Bevel
Gould & Eberhardt 36" Cutter
Michigan Gear Finisher 24" cap., 862-24A
National Broach Red Ring Lapper, Finisher
Schuchardt & Shutte #1 Hobber

GRINDERS, MISCELLANEOUS

Browne & Sharpe #2 Universal 14"x28"
Brown & Sharpe #5, 3"x18" Cylindrical
Browne & Sharpe #3 Universal w/Internal Sps.
Browne & Sharpe #13 Universal Tool & Cutter
Bryant #5. Internal, chucking, 16A16
Cincinnati 6x18" Hyd. #4—Centerless
Grenby Models 1G1 & 1G2—Internal
Gorton Ped. Type Tool Grinder
Heald #73 Internal Centerless, Sizematic
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic
Landis 6"x30" Type C Cyl., 10x24 Univ. 12x30
Norton No. 2, Tool & Cutter
Norton Type C 6"x18" Semi-Automatic cyl
Norton 10"x18" Type C cylindrical
Norton 14"x96" cyl., 16x48 Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Pratt & Whitney Radius Model R6
Rivett Internal with External Sps.
Sellers 6-G Drill Grinder
Sellers 69 Tool, K.O. Lee tool
Van Norman #666 Crankshaft
Wicaco Internal

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Air Hydraulic Presses — Arbor Presses #6C Famco — Band Saws Kalamazoo — Famco 6x12"—Drill Presses all sizes—Hydraulic Press Northern 20 Ton — Injection Molders, 1 ounce — Power Presses, OBI, 1, 4, 4½, 5, 7½, 10, 15, 20, 30, 55, 85 ton—Shapers, 7", 8", 14", 18" Shaperite—Shears, Foot 22" to 8', 16 & 18 ga.—Shears Power 3'x18 gauge to 10' x 10 ga.—Welders Arc Seam Spot all sizes Motors, Grinders, Buffers.

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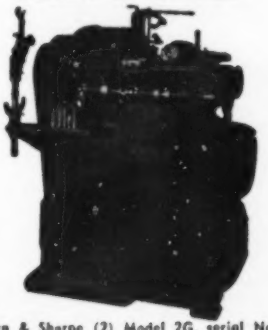

Brown & Sharpe (2) Model 2G, serial No's. 8500 & 11500 series, 1¼", 1½" capacity.
Brown & Sharpe (10) Model 0G, serial No's. 9600 & 10700 series, ⅝" capacity.
Brown & Sharpe (6) Model 00G, serial No's. 14, 15, 1600 series, ⅜" capacity.
Cleco Screw Machine ¾" capacity.
Cleveland, Model AA-11, Serial #36586.
Cleveland, Model B, Serial #42618/843, 1-1/16" capacity.
Conomatic 4 Spindle, Serial 2309FF, 1¼"
Conomatic 8 spindle, serial No. 3947VB 1⅛"
New Britain Gridley 61 6 Spindle, Serial No. 25410, 1⅜" capacity.

GRINDERS, SURFACE

New 8x24" Hyd. Feed, 10x18", 6x18"
Abrasive 8x24", #33 Vert. & #34
Blanchard #16, 26" Mag. Chuck
Browne & Sharpe #5, #2 with Chuck
Heald 22—12" chuck, Arter 12"
Norton 6x18" Hydraulic Vertical
Portman 12" Chuck Rotary
Pratt & Whitney 12x36" Vertical
Thompson Hyd. 8"x24" Hor., Spindle
Taft Pierce #1 Precision

LATHES

American 14"x30", Bridgeford 36"x20', 32"x16'
Gishalt Simplimatic 18"x16½", 2 Tables
Hendey 12"x42" and 12x30", 1941, 16x66"
Hendey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed, 13x42", 17", 1½" Spindle
Lipe-Carbo 12"x18" (2)
Lodge & Shipley #3A, Duomatics
Pratt & Whitney 16"x60—Late
New 16, 18, 20", 28" Immediate Del.
New Tool Makers 10x24", South Bend 9"
Reid Small Piece #9WSL
Rivett Model 918 Precision, Mod. 715
Sebastian 12"x4' G.H., Sheldon 12"
Sundstrand 8x15", 15' Stub
Wickes 32"x35' Geared Head

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Brand New Universal Mills No. 1, No. 2
Archdale Plain, 14" Production
Brown & Sharpe #3B Plain. Late, 3A, 21, #2L
Cinn. No. 3, 4 Plain Spd., 18" Manufacturing
Kent Owens 1V, 1-B, 1-14, 1M
Kempsmith #1 Pl., Vert. & Div. Hd.
Milwaukee 2H Univ., 2H Plain.
Milwaukee #2B, Plain & Univ.
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach, 33
Van Norman #2L Univ. Dividing Head

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Brand New Vertical Mills
Cincinnati 2 Spindle Hydromatic
Cincinnati (2)—1-18 Plain Automatic
Cincinnati #3, #4 hi-power, 08 Vertical
Cleveland No. 1, table 8"x32"
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler 17B 2 sp
Reed Prentice Vert. Mill & Die Sinker

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Bliss 645, 650 Hi-Production Presses
Bliss 18, 19, 21, OBI, 58, 62, 162, OB.
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton SS, Bliss 74½
Bliss 5-48 Dbl. 32x48" bed, Cushion
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 FM Die Tryout Press
New 85, 60, 55, 30, 20, 15, 10, 5 Ton O.B.I.
Niagara Herning, 15 Ton
Niagara A1¾, O.B.I., Niagara No. 27
Stokes Tablet Press, type R, Late, Model F
Toledo 92½c Double Crank 43x23" bed
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Welsh No. 3 O.B.I. 23 Ton, LJ #3
Z & H #4½, O.B.I. 20 Ton

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Acme 6W Fox 2-9/16" Cap. #2 Cross Slid. Turret
Bardons & Oliver #2, 3, 5, 7, Bar Feed
Brown & Sharpe, #2 Hand, #10, 11
Denver 6 2" Shell Turret (2)
Foster #2B 2½" Cap. Morey #2G Late
Gisholt 2L, Cross Slid. Tur.
Gisholt #5, Bar Feed, Plenty of Tools
Gisholt 4R—9¼" hole in spindle
Libby 1H5 with threading att.—3R, 4R
Morey #2G Late
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1, #1A, 2, #4

MISCELLANEOUS

Band Saw: New, Kalamazoo
Bolt & Pipe Threader: Landis, Oster-Williams #915 Pipe & Nipple Threader
Boring Bar: Underwood 4"
Broach: 3L LaPointe Hydro. Horiz. New Klink, 6 Ton, Horizontal, 11 Ton Vertical
Hacksaw: Peerless 6"x6", Racine 6"x6"
Hand Mill: Whitney
Hoist: 5 ton capacity 7½ HP motor
Honer: Micromatic H-4, MC1H
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Oil Groover: WICACO
Pipe Bender, Kane & Roach, Vari-drive
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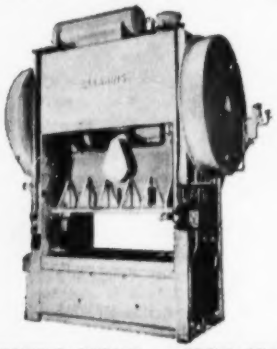

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NIAGARA Double Cranks, 67C, 68C, 612C.

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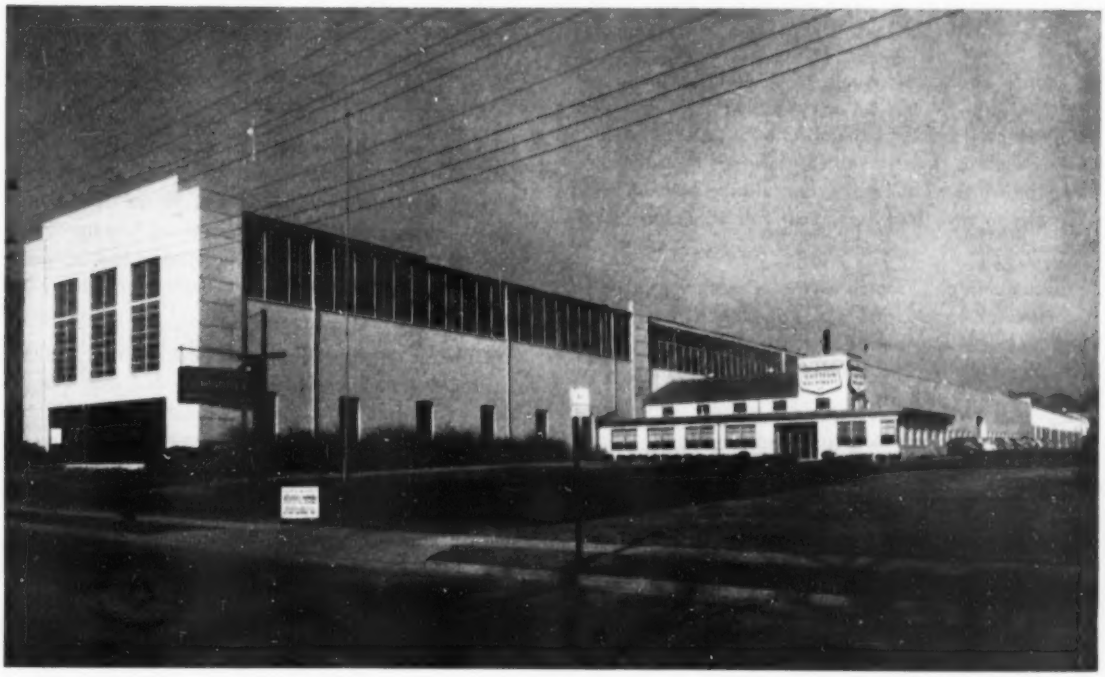

ARBOR PRESSES

No. 37E Wilson Hydraulic, hand operated, 50 tons, new
No. 5 Greenard Arbor Press, floor type, hand operated

AUTOMATICS

4 spindle 1¼" Cenomatic, m.d., bar, 1942 machine
No. 5D Potter & Johnston, m.d.
No. 6A Potter & Johnston, m.d.
No. 6C Potter & Johnston, m.d.
14" Fay Flanders Type, m.d.
4 spindle 2¼" Cleveland Model "K", m.d.
4¼" Model L National Acme Automatic, m.d.
No. 8A Cleveland, m.d., 8" cap., latest

BOLT THREADERS

Victor Nut Facing Machine, m.d., cap. ⅜" to 2" nuts
1" Landis Double Spindle, m.d., thru gear box
1½" Landis 2 spindle, late
1½" Landis 2 spindle, older type

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3½" bar Landis Floor Type, m.d.
4½" bar Niles Table Type, m.d.
5½" bar Niles-Bement-Pond, m.d.
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Pair tables for use on Floor type Horiz. Bor. Mill, 8'9" long x 17½" wide x 36" high, 2 T slots
Pair tables for use on Floor type Horiz. Bor. Mill, 8' long x 15¾" wide x 33" high, 2 T slots
Floor Plate consisting of box type Planer Table 21' long x 48" wide, 12" thick
54"x11' Rectangular Table, 40" high

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42" Bullard Spiral Drive, m.d.
42" Bullard New Era, m.d.
42" King, m.d.
48" Colburn, m.d., 2 swivel heads
100" Niles Heavy, m.d., p.r.t.

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75 H.P. LaPointe Hydraulic Broach, m.d.
Cincinnati Mill Broach, m.d., 10" spindles, new
12x72" Thompson Automatic Flat Broach, m.d.

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No. 1 Brown & Sharpe Spur Gear Tester
12" cap. National Broach & Machine Co.
18" National Broach & Machine Co.

AUTOMOTIVE GRINDERS

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No. 76 Van Norman Automatic Piston Turning & Grinding Machine, m.d., late

CENTERLESS GRINDERS

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6x18" Landis Type C Hydraulic, m.d., late
6x30" Cincinnati Hydraulic, m.d.
No. 10 Brown & Sharpe Self-Contained, m.d.
No. 11 Brown & Sharpe Self-Contained, m.d.
10x36" Cincinnati Hydraulic, m.d.
10x36" Cincinnati Plain Saddle Type, m.d.
10x72" Landis, m.d.
10x72" Norton, motorized
12x36" Landis, m.d.
12x96" Landis Plain Self-Contained, m.d.
14x18" Cincinnati Plain Self-Contained, m.d.
14x52" Norton, motorized
14x48" Cincinnati Plain Self-Contained, m.d.
16x72" Landis Plain, m.d.
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20x120" Landis Plain Self-Contained, m.d.

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No. 151 Besly, m.d.
Hammond Disc Grinder, Model No. 600
Model V10 Hammond Belt Sander, m.d.
No. 4 Gardner Disc Grinder, m.d.
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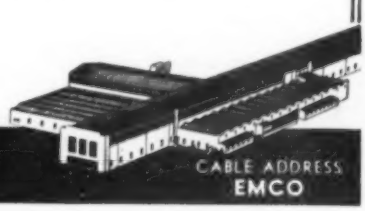

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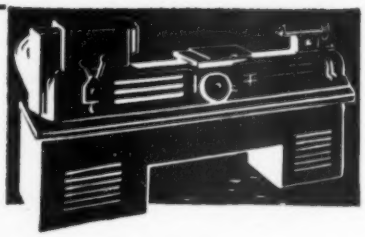

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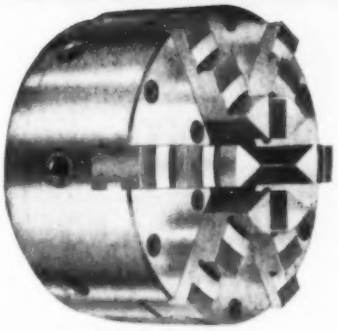
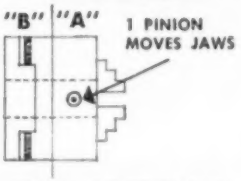
The UNIVERSAL Chuck with .0005 PRECISION!





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Chuck gripping section "A" is like any scroll chuck with one pinion to move jaws. (accurate to .003"). Section "B" shows how chuck "floats" on adapter (.020" clearance) where 4 opposed screws move chuck on adapter for adjustment to dead true precision. Jaws always come back within .0005" on duplicate work.

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An end to most needs for stub arbors, mandrels, or special fixtures . . .

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SIZES AVAILABLE

3- and 6-Jaw Chuck—4" (light duty); 5", 6", 7½" (heavy duty)
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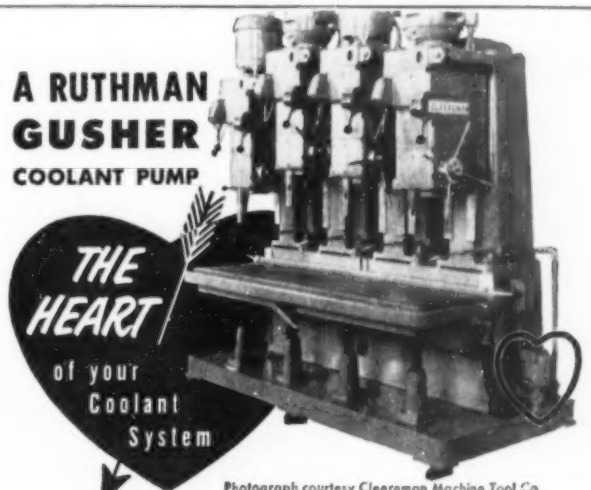
A RUTHMAN GUSHER COOLANT PUMP



THE HEART of your Coolant System

Photograph courtesy Cleereman Machine Tool Co.

You'll go far toward eliminating coolant troubles on your machines when you *specify* Gusher Coolant Pumps. Gushers are precision built! All rotating parts are electronically balanced. Maintenance costs are cut to a minimum. Illustrated is a Model 325 Cleereman Four Spindle Drilling Machine with a Model UL-2106 Ruthman Gusher Coolant Pump.

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Those Who Know Best Buy JOHNSON BAND SAWS

They Prefer Their

✓ Ample Capacity
✓ High Machining Standards
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✓ Ruggedness
✓ Dependability
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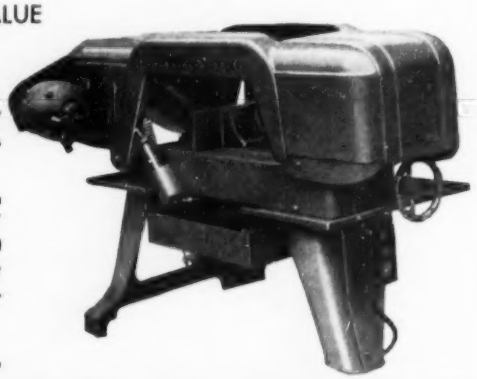
Best Value for the Money—Best Performance

Engineers and Master Mechanics appreciate the plus-value of Johnson Saws . . . the dual frames mean accurate cutting and maximum blade life . . . the 3-point suspension eliminates twisting . . . the heavy axles, etc., all mean one thing to the engineer—VALUE



MODEL J pictured . . . Cuts 10" rounds, 18" flats. Available as a wet or dry cutting machine.

MODEL B also available, a smaller machine . . . Cuts 5" rounds, 10" flats; furnished with or without casters. Really portable. Can be taken anywhere for on-the-job cutting.

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ALBION, MICHIGAN

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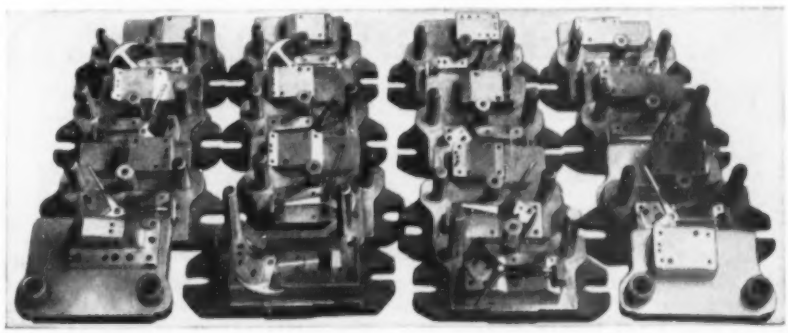

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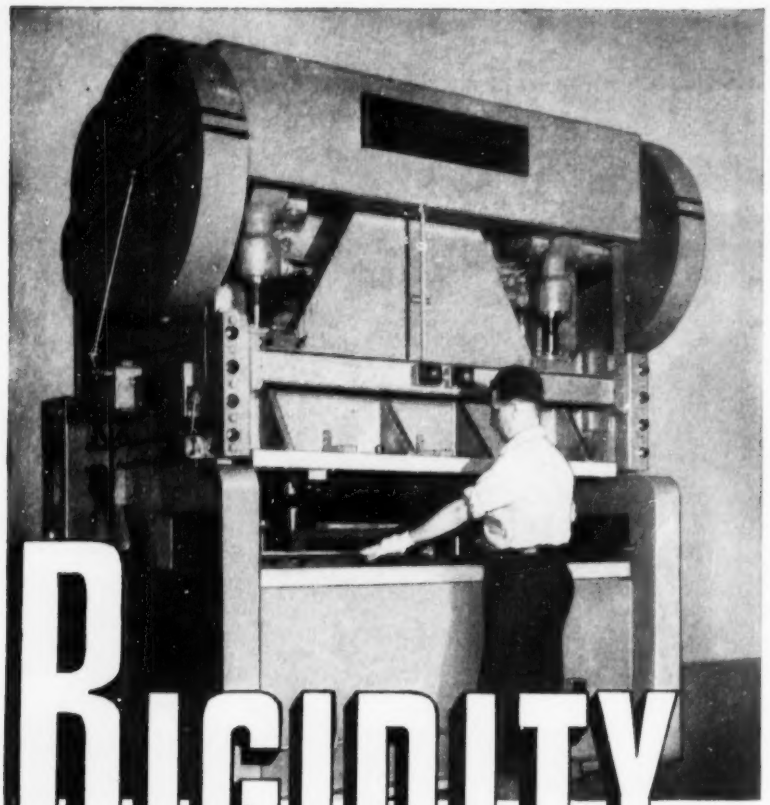

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MANUFACTURERS of METAL FORMING MACHINERY

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BE *Sure* YOUR
NEW ENGINE LATHE
CAN *Take* IT!

The engine lathe you buy today could be the one you will call upon for 'round-the-clock production. Make sure, before you buy, that the lathe of your choice can take such punishment.

ASK ONE QUESTION!
What is the headstock gear arrangement?
MAKE SURE OF THREE POINTS

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(2) That gears are in constant mesh, with speed changes effected by means of sliding jaw clutches; eliminating gear wear due to shifting action.
(3) That the "back gear" is *in front* of the spindle, exerting its powerful downward thrust to offset the lifting action of the tool when heavy cuts are made.

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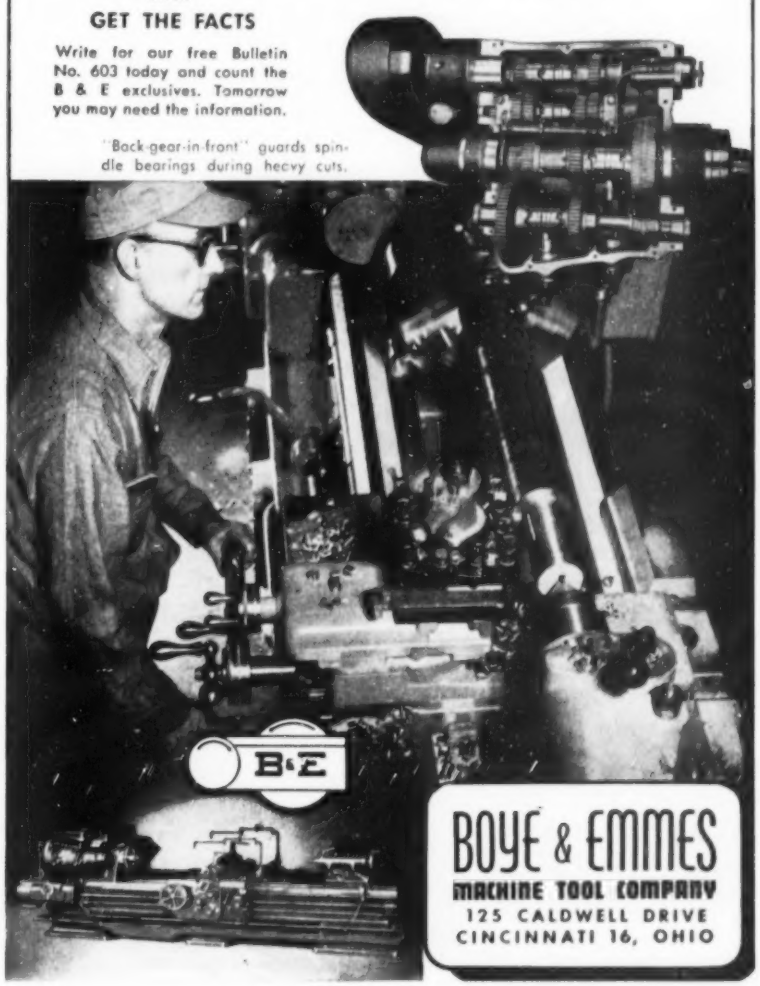
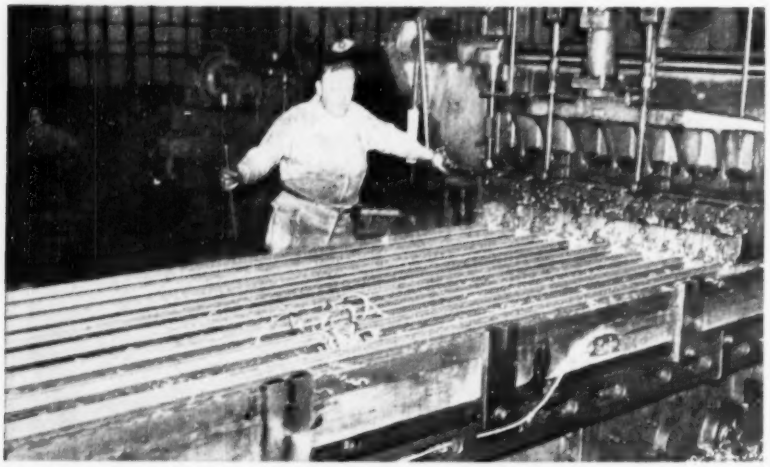


"Back-gear-in-front" guards spindle bearings during heavy cuts.

BOYE & EMMES
MACHINE TOOL COMPANY
125 CALDWELL DRIVE
CINCINNATI 16, OHIO

Walker Magnetic Chuck Reduces Production Time 50 Per Cent



The problem: Hold guide rails 8' to 16' long with small cross section; planed in units of eight, three tool bits per rail. Chuck must hold against twenty-four cutting edges, 90 sfpm, feed 0.060". Close tolerance and finish necessary—tool bits and work pieces cannot be magnetized.

Solution: Walker engineers recommended a chuck installation 60" x 198" with ***balanced magnetic circuit*** essential to proper chip control. The holding power of this installation is more than 200 psi.

Result: Set-up simplified . . . danger of distortion minimized . . . ***two men*** now doing a planing job which formerly required ***three*** . . . production time per piece cut in half . . . work pieces have better and closer tolerances. Neither tools nor rails are magnetized.

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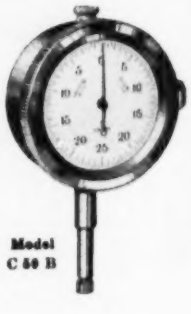

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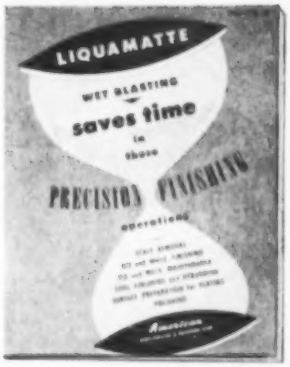
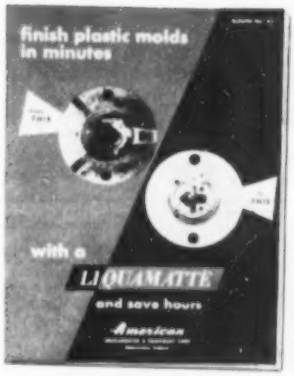
how to cut precision finishing costs



Save Time on Tools, Dies, Molds.
Bulletin 43

Save Time on Glass Molds
Bulletin 53



Save Time on Plastic Molds.
Bulletin 63

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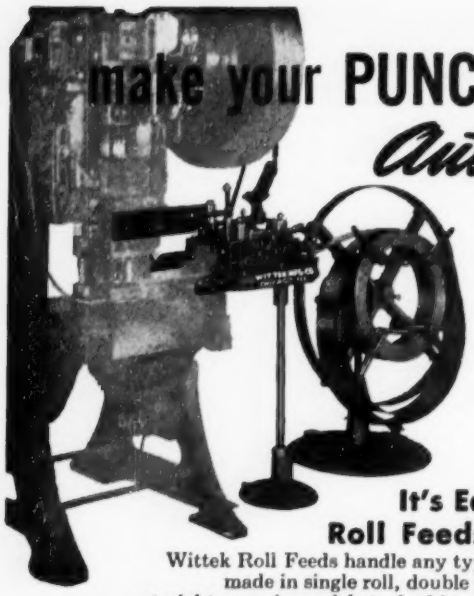

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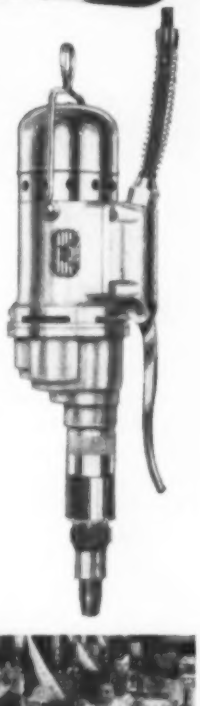

For years, driving screws on the pulley stops of traverse tracks had to be done by hand. Torque must be held within close tolerances. Too much — and the thin-gauge tracks crush. Too little — and the stops loosen.

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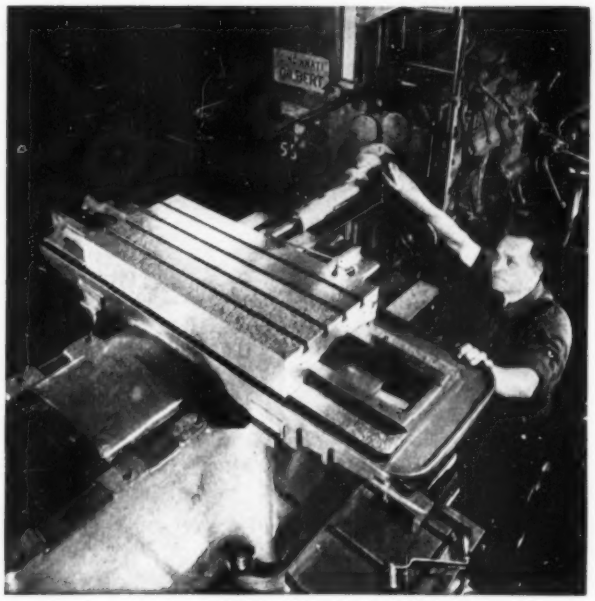

Final proof of Gilbert performance rests in the simple fact that Gilbert customers keep coming back for more. Here are just three out of nineteen carefully documented Gilbert job studies presented in "Performance Counts" Bulletin 1049. Write for it today.

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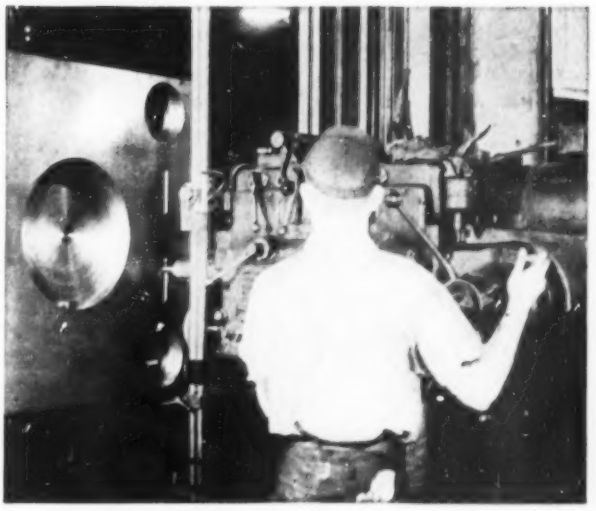

Five sides of workpiece mounted on Gilbert Universal Table (*upper right*) are drilled and tapped on a Gilbert Radial . . . Jig borer base assembly on Gilbert Table Type Horizontal Boring Mill (*above*) is lined up for final machining, and (right) four 8½" diameter holes and one 16½" hole are bored in die set on Gilbert Table Type Horizontal Boring Mill, using stub boring bars.

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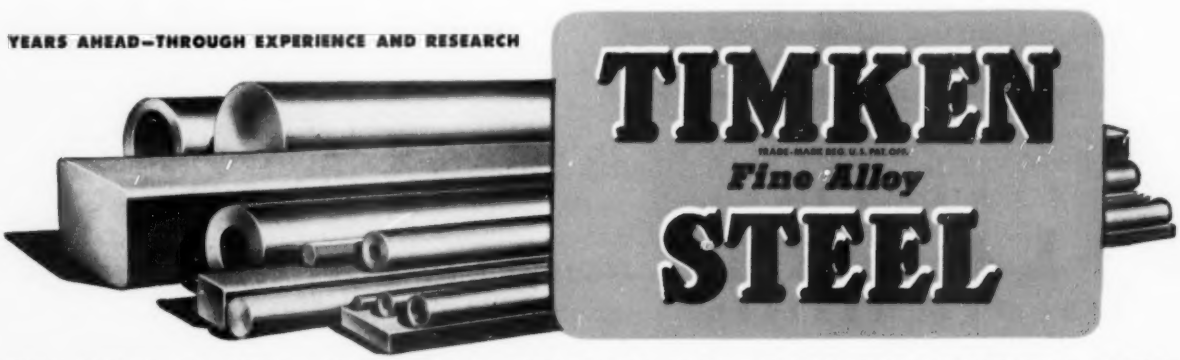

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